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EMERGING PATTERNS OF INSTRUCTIONAL TELEVISION FOR CALIFORNIA PUBLIC SCHOOLS.

BY- HELMKE, GUY M.
CALIFORNIA STATE DEPT. OF EDUCATION, SACRAMENTO

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THIS BULLETIN OFFERS GUIDELINES FOR THE IMPLEMENTATION OF INSTRUCTIONAL TV AND SUMMARIZES THE HISTORY AND PRESENT STATUS OF INSTRUCTIONAL TV IN CALIFORNIA. AMONG POINTS MENTIONED ARE THE FOLLOWING--THERE IS NEED FOR FURTHER LEGISLATION, PERSONNEL, FACILITIES, AND EDUCATION IN CALIFORNIA TO REALIZE THE BEST USES OF TELEVISION. IN 1966 OVER ONE MILLION STUDENTS RECEIVED PROGRAMS BROADCAST BY EDUCATIONAL TV STATIONS, AND OVER 85,000 RECEIVED CLOSED CIRCUIT TV INSTRUCTION IN PUBLIC SCHOOLS IN CALIFORNIA. PROGRESS HAS BEEN SWIFT IN AREAS OF CONCENTRATED POPULATION. REGIONAL ADVISORY COUNCILS HAVE SUPPLIED BROADCAST PROGRAMS TO SCHOOLS AND ADMINISTERED COOPERATIVE FUNDING. IT IS FOUND THAT THE CALIBER OF CLASSROOM INSTRUCTION IS IMPROVED BY TV. TEACHER SHORTAGES CAN BE OVERCOME AND CURRICULA ENLARGED. EDUCATIONAL TV STATIONS IN CALIFORNIA ARE OWNED BY COMMUNITIES OF CITIZENS, PUBLIC SCHOOLS, AND COUNTIES. INTER- AND INTRASCHOOL CLOSED CIRCUIT TV SYSTEMS ARE OPERATIVE. THE CAPITAL OUTLAY FOR INSTRUCTIONAL TV EQUIPMENT IS SMALL IN COMPARISON WITH THE CONTINUING COSTS OF OPERATION AND MAINTENANCE. (MS)

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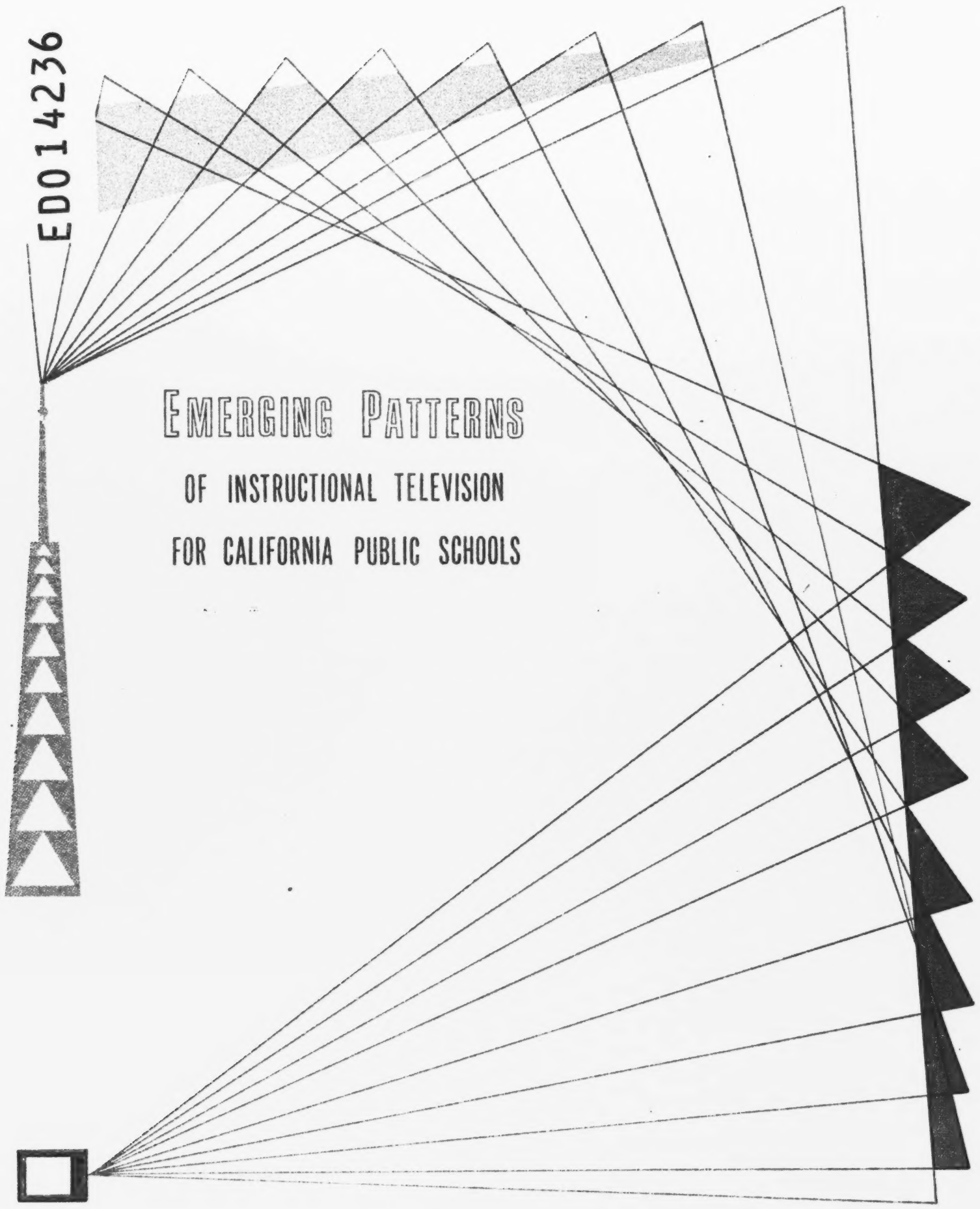

CALIFORNIA STATE DEPARTMENT OF EDUCATION
MAX RAFFERTY-Superintendent of Public Instruction
SACRAMENTO 1966

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
OFFICE OF EDUCATION

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EMERGING PATTERNS of Instructional Television for California Public Schools

Prepared by Guy M. Helmke
Special Consultant, NDEA
Bureau of Audio-Visual and School Library Education

Foreword

The educator's job today is clear—to serve the educational needs of children who after only a few years in our schools must enter a world of sophisticated computers, atomic-power-propelled vehicles, interplanetary exploration, and rapidly expanding content in all fields of knowledge. So great and so pressing are the needs for education that they can be filled successfully only by the utilization of every possible tool that can be placed in the hands of competent and creative teachers.

One such tool for teaching in the twentieth century is television. Well-selected printed materials, motion pictures, and other teaching devices have long been used to support and supplement the regular teacher's instruction in his own classroom; now being recognized is television's potential for extending over great distances and presenting in thousands of classrooms lessons presented by teachers who are masters in their fields of specialization. And television can transmit master teaching to schools regardless of political boundaries, racial differences, or socioeconomic stratification. It is one way in which equal educational opportunity may be realized.

While California educators have done much to use television effectively in our schools, there is still a great deal more that they can do and need to do with television for instructional purposes. We urge the involvement of teaching, curriculum, media, and administrative personnel in the necessary planning and orientation for utilization of television for classroom instruction. These personnel should weigh the instructional purposes for which the installation is to be designed, the extra maintenance which the equipment will require, and the continuing instructional and operational planning which the medium will require. They should give special attention to long-term planning with reference to growth and expansion in terms of design of installations, maintenance, operating costs, and personnel. This publication will help school districts to implement those portions of their own instructional programs which the television medium, after careful assessment, can best serve.

Max Rafferty

Superintendent of Public Instruction

Preface

The increase in televised instruction at all levels of education in California has been steady and impressive. It has caused a growing number of school people to consider television as a means of solving some of their problems. Consequently, they need up-to-date information on the use, cost, design, installation, and potential of instructional television equipment. The Bureau of Audio-Visual and School Library Education has continually received requests for information, many of them from school district personnel who were concerned in developing instructional television through NDEA, Title III, projects.

To meet the need for information on instructional television, this bulletin has been prepared by Guy Helmke, Special Consultant, NDEA, Bureau of Audio-Visual and School Library Education, with the help of the following persons:

William H. Allen, Director of Research, Department of Cinema, University of Southern California

Leon Fletcher, Coordinator of Instructional Services, Monterey Peninsula College

Warren L. Wade, Coordinator of Instructional Media, Office of the Santa Clara County Superintendent of Schools; Station Manager, KTEH, Channel 54, San Jose

Max Watson, Communications Engineer, Santa Clara County Department of Communications

Jacob Wiens, Director, The College of the Air, San Mateo College

The contributions of these people are gratefully acknowledged.

DONALD E. KITCH
Acting Chief
Division of Instruction

HARRY J. SKELLY
Chief, Bureau of Audio-Visual and School Library Education

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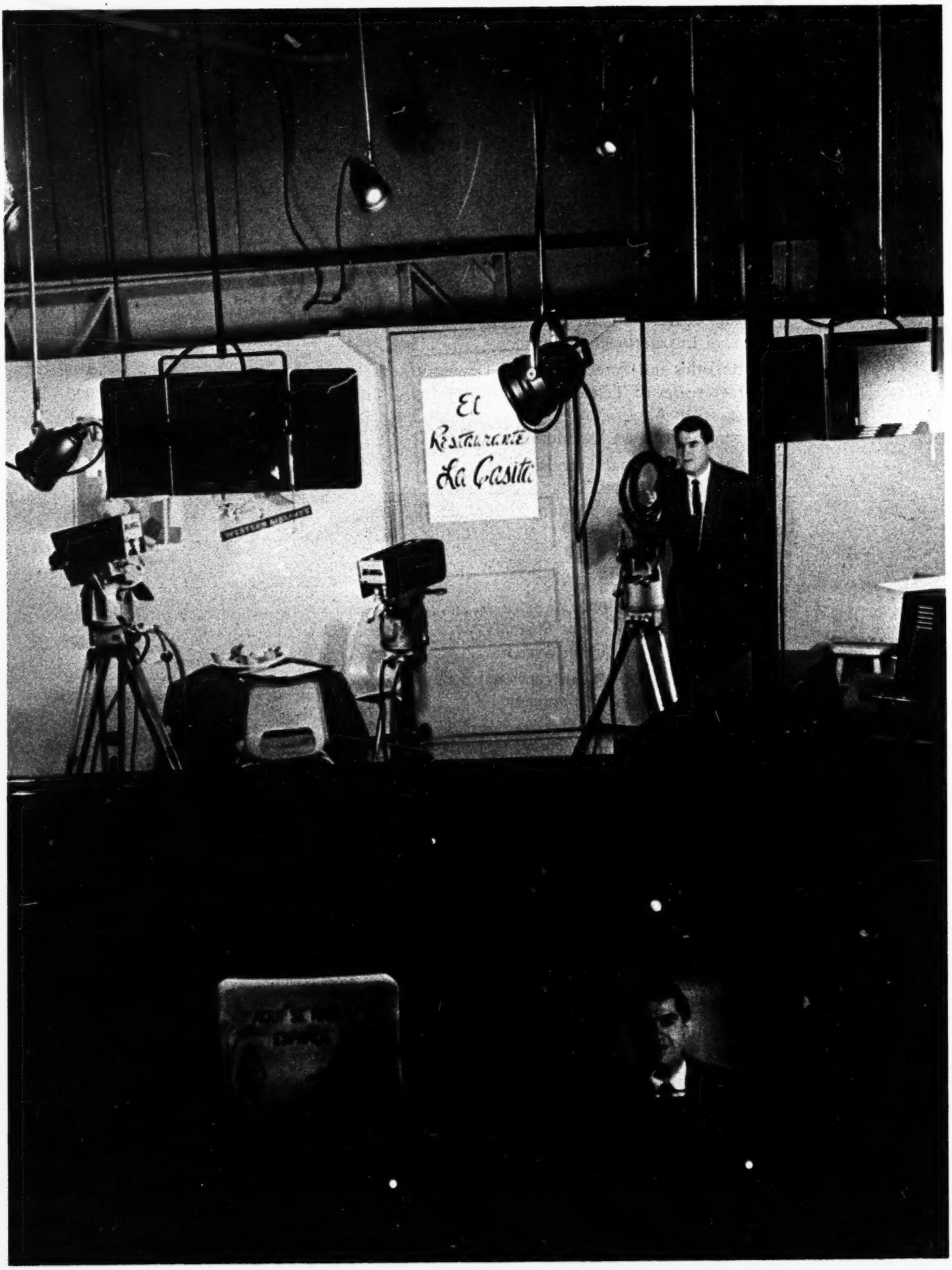

El
Restaurante
La Casita

Introduction

In the 1965-66 school year, approximately one million public school students received some televised instruction. Most received it in their regular classroom during school hours; some, in larger areas especially prepared for the efficient use of television; and some received lessons at home for credit. In addition, several thousand teachers also viewed televised courses as part of their inservice training after school hours.

Those charged with leadership for instruction in the public schools of California must assume a significant responsibility in facilitating maximum use of the best learning resources now available to education. Teaching quality must be improved, and learning time must be economized if today's children—tomorrow's citizens—are to be equipped with the knowledge and skills demanded of them to solve the problems of their own generation as well as the problems still unsolved by our generation. Instructional television holds promise for educators in helping to meet the demands that are upon them now.

What, then, is instructional television? Clarification of the difference between "instructional" television and "educational" television seems desirable. "Educational television" is the more general term; it refers to types of educational programs having interest for the general community as well as the schools. "Instructional television" refers to programs designed for in-class viewing during regular school hours or to televised courses offered for credit from a school or college.

The primary purpose of this bulletin is to offer to the educators and legislators of our state and to the interested laymen of our communities guidelines for the implementation of instructional television installations and programs in the public schools of California. This publication also presents a summary of the history and present status of instructional television in California; it describes some of the major developments in instructional television which have already taken place and some of the problems yet to be solved:

- The need for additional legislation to permit school districts, offices of county superintendents of schools, and the State Department of Education more freedom for participating in the development of instructional television
- The need for personnel and facilities in the State Department of Education to provide necessary leadership to coordinate regional developments and programming
- The need to educate the lay public and educators as to the real value and possible best uses of television in the present and in the future

These problems are not peculiar to this particular time in the development of educational and instructional television. It was in August of 1952 that the California State Department of Education initially took leadership by calling the first statewide meeting to consider the problems of educational and instructional television. That meeting was held less than six months after the Federal Communications Commission had announced its allocation of television channels for the specific use of education in eight of the population centers of California. The Superintendent of Public Instruction then defined the position of the State Department of Education in a four-point statement:

1. Educational television involves much more than classroom applications. It is an educational resource belonging to all the people, to be used by all the people, for the benefit of all the people.
2. This means that financial support and use of it must be much broader than is envisioned in the present structure for financing education in California. Educational television involves all groups concerned with the public interest, including state and local agencies of government.
3. Since it concerns all the people, state planning and assistance will be needed. Orderly step-by-step developments must be directed toward eventually making educational television facilities available to all the people of the State.
4. Local responsibility for the program planning, presentation, and utilization must be accepted and protected.[1]

Later in 1952, approximately 2,500 community leaders from all areas of California participated in the Governor's Conference on Educational Television. Launched at that meeting and led by the State Department of Education was the movement which resulted, in 1957, in the first legislation to authorize limited participation in television by the public schools of California. Since then, some additional permissive laws have been enacted, and the need for further legislative action has developed.

[1] *Proceedings of the Governor's Conference on Educational Television.* Sacramento: The State of California, 1952, p. 24.

The California State Department of Education has continued its leadership in the expansion and the improvement of instructional television through a variety of activities. In 1960 the Department published the report of a statewide study, *Television for California Schools*.[2] That report summarized the substantial research of the effectiveness of televised instruction and offered 13 recommendations "for action at various levels—state, county, and school district—and on a regional basis." With this present publication, the California State Department of Education is continuing its efforts by identifying the significant patterns that are emerging in instructional television as it is being developed and used in the public schools of the state of California.

[2] William H. Allen, *Television for California Schools*. Bulletin of the California State Department of Education, Vol. XXIV, No. 4, April, 1960. Sacramento: California State Department of Education, 1960.

CHAPTER 1

The Development of Television in the Public Schools of California

In population California is the largest state of the Union, and geographically it is one of the largest. Its climate varies from extreme heat to extreme cold. Its geography includes deserts in the Southeast, rain forests in the Northwest, broad valleys, and complicated mountain systems. This diversity in climate and terrain determines to some extent the areas of concentration of California's population, and the mountain ranges tend to limit transportation and communication. Consequently, instructional television in California has expanded in an irregular pattern.

HISTORY OF INSTRUCTIONAL TELEVISION

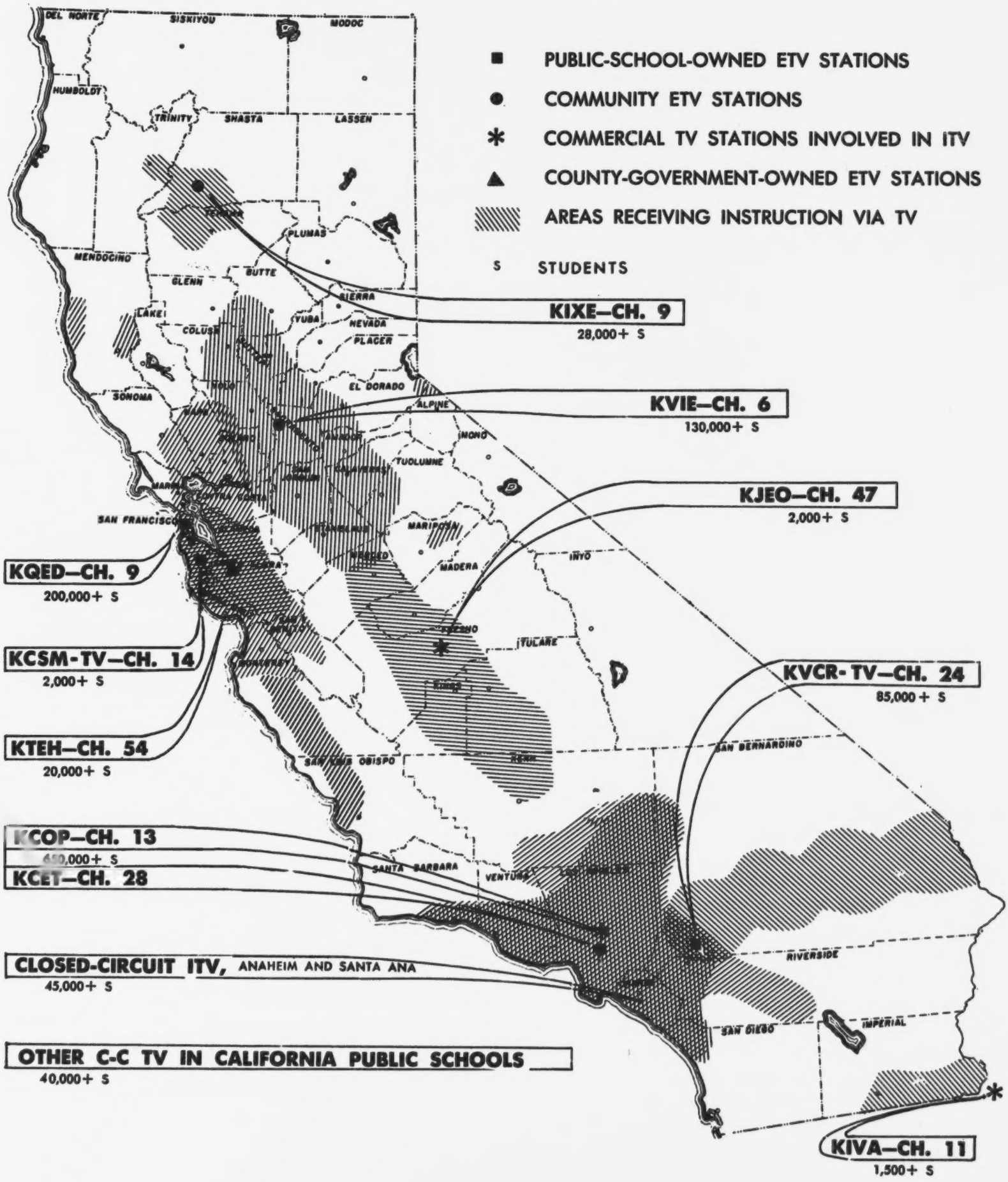
National commercial television developed comparatively recently and with considerable speed. At the end of World War II, only six television broadcasting stations of any kind had been authorized by the Federal Communications Commission and were on the air, and only 6,500 receiving sets were in use in the whole country. But television captured the people's fancy as no other communications medium, including film and radio, had done before. By 1948, 40 stations were on the air and some 600,000 receiving sets were in use. New technical developments and the probability of overcrowding of the 12 VHF (very high frequency)[1] channels then available forced the FCC to "freeze" the channels authorized up to that time and to refuse to issue any more station permits until further planning could be accomplished. The planning period extended until April of 1952. Then the FCC opened 2,053 VHF and UHF (ultra high frequency) channels for allocation, 242 of which were set aside for noncommercial educational stations.

In California, interest among educators and the public was very high. Response to the action of the FCC was immediate. Roy Simpson, then Superintendent of Public Instruction, invited a committee of educational, commercial, governmental, and labor representatives to meet in Sacramento to discuss the implications of the FCC's action. Dr. Simpson conveyed to Governor Earl Warren the committee's suggestion that a statewide conference be called. The Governor agreed, and a conference of approximately 2,500 civic leaders, educators, and legislators was called at Sacramento on December 15-16, 1952. The consequences of this conference organized by the Department of Education in the early history of educational television planning were manifold: The conferees expressed a desire for programs of a more serious, instructive, and cultural nature than those generally available on commercial stations at the time. The conference provoked sober speculation among educators as to television's possible role in alleviating a shortage of teachers for California's growing population. It brought into focus the need for the initiation of constructive legislative action with regard to television's place in the schools of the state. Educators and the public were reluctant to relegate television to the limbo into which radio as a medium of instruction had already fallen. Legislators, however, needed more decisive proof of the value of television to the schools. The time was not yet right, and legislation permitting schools to pay for television programs was five years away.

The first successful educational television station in California, Station KQED, Channel 9, began broadcasting in San Francisco in June, 1954. However, despite the fact that a number of legislative bills were written for support of instructional television in public schools, it was not until 1957 that the California State Legislature finally passed laws authorizing the public schools to participate financially in television as an instructional medium. To the Education Code, the legislation added provisions permitting governing boards of school districts or county superintendents of schools acting for these boards to enter into contracts for the purpose of procuring television broadcasts for use in the educational programs of the public schools. Rather careful limitations within the provisions specified that no school organization could own or operate a broadcasting station. However, the fact that school districts could write contracts and pay for instructional programs over broadcast stations had an immediate effect. Station KQED, Channel 9, in San Francisco, hired an

[1] See page 11 for an explanation of VHF and UHF ranges.

Instructional Television in California



instructional television director and on November 3, 1958, began producing and broadcasting regular instructional programs for the public schools in the ten San Francisco Bay area counties. In the Sacramento central valley area, a group of 15 county superintendents of schools hired a director of instructional broadcasts, organized district contributions, and set up Station KVIE, Channel 6, in Sacramento for the purpose of broadcasting instructional programs to public schools. Station KVIE began broadcasting in February, 1959. In the Los Angeles area, obstacles were too great to set up an educational TV station. However, the Los Angeles County Superintendent of Schools held organizational meetings and in the latter part of March, 1959, began to televise live instructional programs presented on public service time and purchased time over commercial Station KCOP, Channel 13.

In the four years from 1957—when the California Legislature authorized participation in broadcast TV programs by school organizations—until 1961, the number of students receiving televised instruction in California during school time or for credit rose from a few hundred to almost a half-million.

In 1961 further legislation authorized school organizations to own, lease, and operate broadcast transmission facilities for use in providing instructional services. It took several years for the effect of this legislation to become manifest. In 1962 San Bernardino Valley College constructed a UHF station and began broadcasting instructional programs over station KVCR-TV, Channel 24, the first public-school-owned broadcasting station in California.

In the fall of 1964, four new educational television stations, Station KTEH, Channel 54, in San Jose; Station KCSM-TV, Channel 14, in San Mateo Junior College; Station KCET, Channel 28, in the Los Angeles area, and Station KIXE, Channel 9, in Redding began broadcasting instructional programs to schools. It is interesting to note that, of these four stations, two—Channel 28 in Los Angeles and Channel 9 in Redding—follow the usual pattern of educational TV stations, being organized by nonprofit-making corporations of citizens. Channel 14 is organized by San Mateo Junior College and, being public school owned, it has an organization similar to that of San Bernardino Valley College's station. Channel 54 in San Jose, however, is representative of a unique concept: meeting the needs of the entire county. The Santa Clara County Superintendent of Schools is the general manager of the station; technical advice and engineering services are the responsibility of the county communications agency; and program service is directed to county governmental training needs as well as instructional needs.

That local need expressed through legislation has had a profound effect upon instructional television in California is confirmed by the four educational stations activated in California in 1964. Such a concert of activity is not only the statement of a need for television facilities expressed by the public through permissive legislation, but also in some measure the result of action to comply with mandatory legislation. When the Legislature passed permissive legislation regarding instructional television in 1961, it also passed laws which made it mandatory for all public schools to teach a foreign language in grades six, seven, and eight by the fall of 1965. Confronted with a shortage of teachers of foreign languages and no allocation of state funds to be used to implement the law, school administrators looked hopefully upon instructional television as an aid not only in training their potential foreign language teachers, but also in carrying into the classroom, through television, master linguists and instructors in foreign language.

Public Law 864, the National Defense Education Act, was passed by the United States Congress in 1958. From 1959 until the present, matching federal funds administered by the State Department of Education have been available to school agencies for the purchase of equipment and materials to improve instructional programs in science, mathematics, and modern foreign languages. The law was amended in 1964 to include programs in the "critical" subjects of English, reading, geography, history, and civics; and, in 1965, to include economics. One of the items most frequently requested by school districts through NDEA, Title III, projects has been television equipment, particularly receiving sets. It is estimated that more than 8,000 television sets have been purchased with NDEA, Title III, funds by school districts in California. It is also estimated that considerably more than 700,000 students are receiving instruction in the public schools of California using the sets purchased with Title III funds. A large proportion of the sets have been purchased by school districts wishing to take advantage of foreign language programs being broadcast from educational television stations. In this instance, the federal law has allowed matching funds to support school districts endeavoring to implement a state legislative mandate.

On May 1, 1962, Public Law 87-447, the Educational Television Facilities Act, was signed into law. This federal act authorized appropriations totaling $32 million over a five-year period for federal matching grants to be used in the acquisition and installation of transmission apparatus for noncommercial educational

broadcasting. Rules and regulations were published on June 1, 1963, and proposed or established educational stations could make application to the U.S. Commissioner of Education for funds. The act was rather specific in limiting the grants to broadcast television facilities—not closed-circuit systems—and to equipment and its installation. The basic intent of this act was to support nonprofit educational television in urban areas, where the population was concentrated, thereby utilizing the federal grants most efficiently. The $1 million allowed to California has now been expended in grants to educational stations; the funds have been of great assistance not only in the development of new stations activated in 1964, but also to those in existence at the time.

Additional requests for funds to activate broadcast television stations in the San Diego, Santa Barbara, and Fresno areas are awaiting further appropriations. Educational television leaders hope that the present guidelines for this act may be redesigned; that the act may be extended so that California's share may be larger; that the act may be extended for as long as five years; and that matching funds for translators and similar devices to retransmit broadcast signals into rural areas may be enlarged and extended.

Public Law 87-447 had been anticipated in California in 1961 by legislation creating within the State Department of General Services a Television Advisory Committee, composed of the Director of General Services or his representative, a representative of the University of California, a representative of the Board of Trustees of the California State Colleges, a representative of the State Board of Education, and one member representing the existing community educational channels. These members serve at the pleasure of the Governor. The position of Television Coordinator was also created within the Department of General Services. The Television Coordinator is appointed by the Governor. His duties are to prepare a statewide plan for television to serve the educational needs of the state, to process applications for federal funds, to advise in the allocation of television channels for educational purposes, to coordinate activities of various public and nonprofit agencies concerned with educational television, to supervise a clearinghouse for information on television for educational purposes, and to review applications for educational television transmission licenses.

Provision was written into the law making the committee and the position of the coordinator operative only when federal grants in aid for educational television become available to public agencies in California. The committee met in 1963, when rules and regulations and guidelines were written and funds appropriated for Public Law 87-447. A coordinator reported for duty on September 1, 1964.

In July of 1962, the 87th Congress passed legislation called by television people the "all-channel" law. This law made it mandatory for all television receiving sets imported or manufactured and transported between states for sale to operate on all broadcasting frequencies (UHF as well as VHF) released for use by the Federal Communications Commission. The "all-channel" law became effective on April 30, 1964. All receiving sets must now be manufactured to receive all channels; i.e., channels 2 through 83. This law has had the expected effect of strengthening recently activated UHF broadcast stations by supplying potential viewers in their broadcast areas with proper receiving sets. An example is the success of the new Channel 28 in the Los Angeles area.

In 1963 the California Legislature passed laws authorizing county boards of supervisors to contribute to nonprofit television broadcasting facilities and authorizing public school agencies to accept grants in aid from public or private sources to finance instructional television broadcasting.

The 1963 legislature also passed Assembly Bill 9, which set up a pilot program for instructional television in one county in the state (San Bernardino County) allocating $60,000 for a two-year period, to reimburse school districts contracting for program services at 25 cents per viewing student per year.

In August, 1964, the State Department of Education activated a Public School Instructional Television Committee. The Superintendent of Public Instruction named the members of this ad hoc committee from television administrators in all areas of California. At its first regular meeting on February 26, 1965, the committee created subcommittees in the areas of legislation, programming, and compatibility standards for exchange of programs. One of the committee's main purposes was to provide better lines of communication among educators, the State Superintendent of Public Instruction, and the representative of the State Board of Education on the Advisory Committee on Educational Television relative to public school television needs.

The Public School Instructional Television Committee has had effective influence in the development of recent legislation in support of instructional television. The 1965 Legislature passed Senate Bill 635, which appropriates $800,000 of state funds from the 1965–66 budget with which to reimburse, at 50 cents per viewing student, counted during the prior year,

those school districts contracting for instructional television programs. Reimbursement is not to exceed one-half of the cost of providing instructional television.

STATUS OF INSTRUCTIONAL TELEVISION

The progress of instructional television in the public schools of California is indicated by the following comparison. In the fall of 1962, it was estimated that 350,000 students in elementary and secondary schools were viewing instructional programs beamed to classrooms from three educational television stations and one or more commercial stations televising the programs on purchased time or public service time. Early in 1966 more than one and a quarter million students were receiving programs broadcast from seven educational television stations and one or more commercial stations.

During the same period, progress has also been made in instructional closed-circuit television. In the fall of 1962, 27 public school districts and junior colleges were equipped with some type of closed-circuit television facilities. Of these, 6 were in elementary school districts, 11 were in high schools, and 10 were in junior colleges. Early in 1966, the count of closed-circuit television systems had risen to 74. Of these, 25 were in elementary school districts, 32 were in high schools, and 17 were in junior colleges. Closed-circuit systems range from large, interschool district systems and complete campus systems to modest magnification, single-classroom systems. More than 85,000 students were receiving instruction in public school classrooms by closed-circuit television in 1966.

Progress has been very swift in regions where population is concentrated. A little progress has also been made in extending broadcast programs into less populated areas by means of translators, microwave, and cable. Some rural facilities are publicly owned, but some are leased from or operated by commercial companies and the services are contributed or bought for public school use. There appears to be little hope of deriving sufficient funds from the Farr-Quimby Act of 1965 to relieve the need for instructional television programs in sparsely populated regions. Redefinition of the Educational Television Facilities Act of 1963 may have some slight effect on balancing the current unequal condition, but realism dictates a plea for some form of equalization aid.

Of all the patterns which have emerged in instructional television in California, one of greatest significance is the development of regional instructional television advisory councils or associations. These cooperative systems of offices of county superintendents of schools and school districts usually perform the same general function; namely, to supply to the schools of the region, over broadcast television, programs appropriate to the schools' courses of study and to administer cooperatively the funding for getting the programs broadcast into the classrooms. A list of such associations follows:

- *RETAC—Regional Educational Television Advisory Council.* Eight counties in the Los Angeles area are served by this cooperative. Los Angeles is the agent county. More than 650,000 students are currently instructed by means of RETAC and other programs broadcast from ETV station KCET, Channel 28, and commercial station KCOP, Channel 13.
- *VITA—Valley Instructional Television Association.* Sacramento County is the agent for this association, which serves 14 counties. More than 130,000 students are currently instructed by means of programs broadcast from ETV station KVIE, Channel 6.
- *BRITE—Bay Region Instructional Television for Education.* BRITE consists of 15 cooperating counties, mainly in the San Francisco Bay region. More than 200,000 students are receiving programs coordinated by BRITE and transmitted from ETV station KQED, Channel 9, in San Francisco.
- *ITAC—Inland Television Advisory Committee.* Centered at the office of the San Bernardino County Superintendent of Schools, ITAC coordinates the instructional programs broadcast from station KVCR-TV, Channel 24, to more than 90,000 students. These programs are broadcast mainly in San Bernardino County, but also by agreement in Los Angeles and Riverside counties.
- *NITAC—Northern Instructional Television Advisory Council.* An eight-county cooperative serving more than 20,000 students, NITAC coordinates programs broadcast from ETV station KIXE, Channel 9, in Redding, Shasta County.
- *San Joaquin Educational Television Association.* This involves five counties in the vicinity of Fresno.

San Diego County is organizing a similar council to plan and implement instructional television programs over Channel 15, whose station will be activated during the 1966–67 school year.

Regional instructional television associations are not only significant in terms of instructional planning and programming for television; they have also served in shaping regional planning for federally funded research and resource projects now entering California's educational picture.

CHAPTER 2

Characteristics and Potentialities of Televison

The decision to use a television system for a school should be made after analyzing which of the school's needs television might serve and assessing television's potential to serve those needs. Although this bulletin cannot suggest precise answers for every school situation, it can (1) describe the characteristics of television; (2) suggest specific questions which need to be answered by school personnel when considering the inclusion of television in the instructional system; and (3) help to evaluate television's potential.

CHARACTERISTICS OF TELEVISION

Television has at least seven characteristics:

- *TV can transport.* Television can transmit instruction and other types of information over long distances to widely separated viewers. Instruction-relevant information, facilities, events, and resources from remote locations can be presented conveniently in classrooms.
- *TV can multiply.* Economically and conveniently, television can multiply the number of viewing points and of viewers who can see one program, and it can multiply both simultaneously.
- *TV is immediate.* The most current information of relevance to a subject or professional activity can be transmitted without delay.
- *TV is reproducible.* Instructional materials reproduced through video tape, kinescope, and film can be presented in viewing locations with a flexibility which helps meet the scheduling requirements of the viewing organization. Flexible scheduling is particularly important on the secondary school level. Reproducing also permits demonstrations and resources of quality and continuing importance to be preserved and reused without further expenditure of teacher time and materials.
- *TV can magnify.* The implications of magnification are particularly important in science. Physics and chemistry demonstrations and experiments which have been difficult for all but front-row students to observe with clarity under conventional conditions can be seen with ease by the entire class. Small-scale objects can fill a TV screen if desirable. Microscope slides, test tubes, dissected frogs—all are equally magnifiable on TV.
- *TV can transpose.* Because of television's electronic capability to transpose polarity, such objects of interest as X-ray plates can be studied with far greater facility than is possible with the naked eye. Negative images can be made positive, contrast can be heightened or deemphasized, invisible images can be made visible through the use of infrared camera pickup tubes, and images can be inverted to direct attention.
- *TV can juxtapose.* Through the use of video tricks, including the split screen, the electronic matting device, and superimpositions, objects which are physically separated can be juxtaposed to provide greater understanding in terms of their relation to each other.

QUESTIONS TO ASK

Once the characteristics of television are recognized and understood, it is necessary to ask questions which can help determine the appropriateness of television in helping to solve specific educational problems. Among the questions which would then need answering are these:

1. *What do you expect television to do for your school?* Be specific; identify particular problems; then assign individual tasks to television.

2. *Under what conditions do you expect television to complete these tasks?* How long will the daily operating schedule be? What personnel will be provided? What equipment will be needed? What will the budget be? What will be the physical environment?

3. *What will each piece of television equipment be expected to contribute?* What quality will you need? Reliability? Who will operate it? How sophisticated

Planning televised lessons involves classroom teachers, subject area supervisors, administrators, TV coordinator.

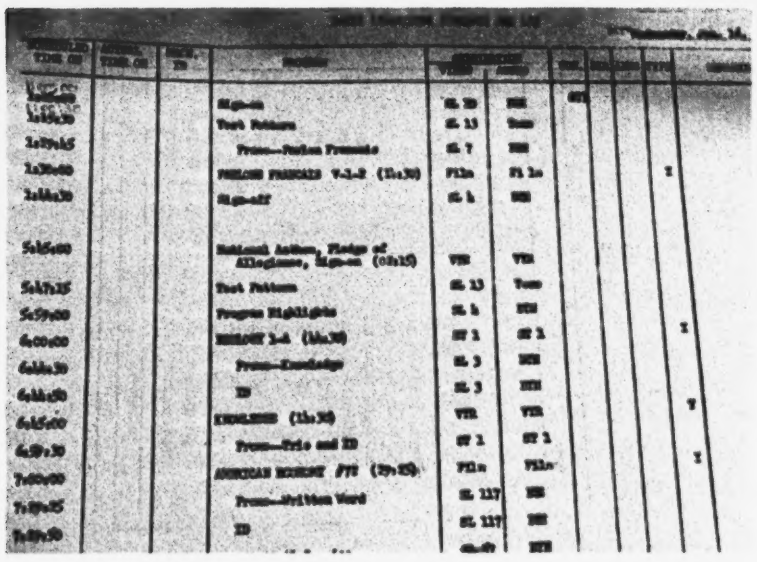
or how simple must it be for effective operation by the personnel you intend to assign to the job?

4. *What alternatives are possible?* Leasing television equipment? Borrowing? Cooperating with other schools or districts. Using film? Reorganizing conventional instruction?

These questions must be answered in the context of the total instructional system, not of television alone. The components of this system include (1) learning-communication theory; (2) the human instructor; (3) the media of mass instruction (including films, filmstrips, radio, and TV); (4) the media of individual instruction (these include textbooks and autoinstructional materials and devices); and (5) the learner. The ultimate objective should be the most effective combination of the identified components to improve instruction and learning in a given situation. Thus, the answer to the second question might be a film, a book, revisions of existing instructional materials, or more probably a combination of these. At times, the answer might well include television. But the emphasis must remain on using television, like other teaching tools, to solve specific instructional problems. Television should not be superimposed on an existing educational program simply as an additional or supplemental devise used just for its own sake.

Thus, television must become for your schools not simply an attempt to extend into the classroom that glamorous, extravagant giant of Hollywood; but rather television must be designed as and operate as a practical, studied, effective, economical teaching aid—another implement in the growing box of tools available to our teachers to increase and expand the effectiveness of their instruction.

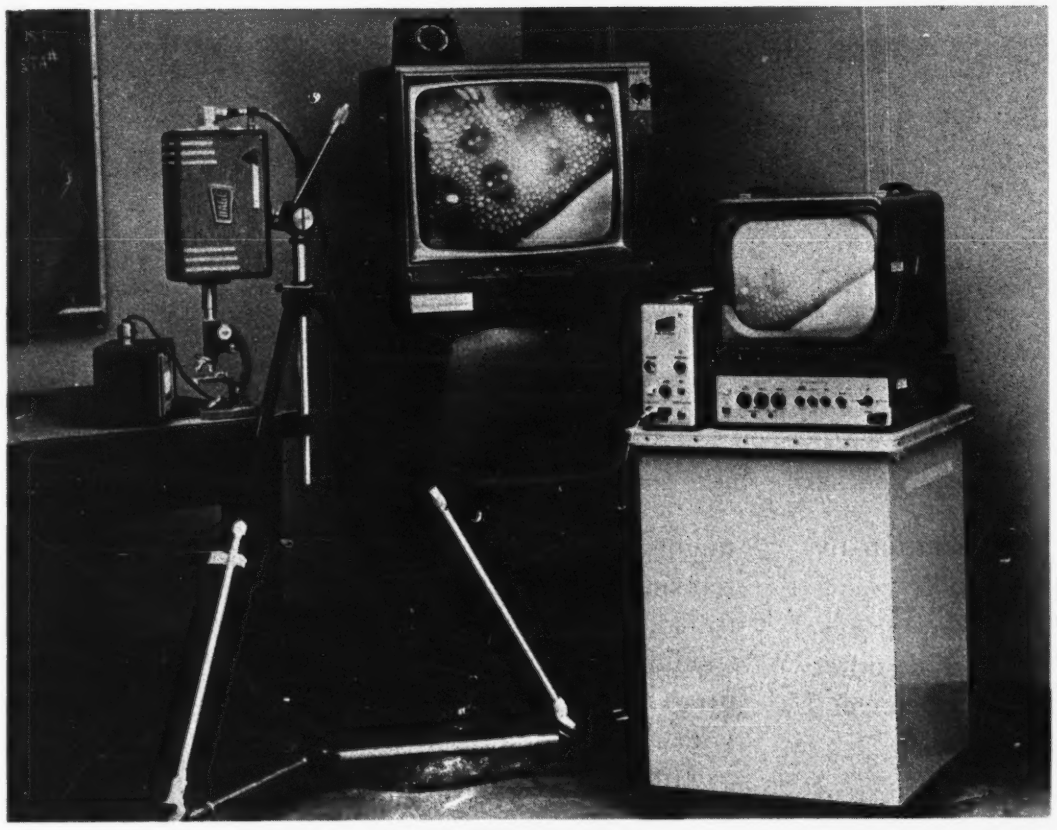
Daily planning includes an operations log, required for broadcast stations under FCC.



POTENTIAL EFFECTS ON INSTRUCTION

Of course, assessing the potential of TV in any given school situation obviously is a task which can be accomplished only by those who are familiar with the characteristics of the school and the community it serves and who are responsible for the decisions affecting the pattern of development at that school. Nevertheless, television makes specific contributions to instruction that are directly ascribable to one of the seven characteristics of the medium:

- Classroom instruction is upgraded because television brings the best teachers available in the district or nation to present a portion of the instruction in a particular subject.
- The caliber of instruction by local classroom teachers improves since they, too, benefit from observing the TV instructors and, in addition, receive frequent inservice teacher education courses by television.
- Instruction in subject areas where critical teacher shortages exist is available to students via television whether or not qualified teachers can be secured



The industrial type of camera (left) photographs and magnifies the material on the slide of the microscope. The classroom receiving set (center) displays the picture and emits sound from the microphone. (The receiver at right is a monitor, which shows a picture but does not reproduce sound.)

by the school system involved. This has particular significance today in modern foreign languages, science, and mathematics. And, through the *proper* utilization of the medium, more efficient use can be made of language, science, and mathematics teachers already on the staff, their energies directed more to individual student problems and abilities.[1]

- The presence of inspirational instructors on the TV screen and the availability of programs to meet varying levels of student ability can be expected to improve student motivation and achievement.
- Curriculums enriched, enlarged, and enhanced by instructional resources from national, state, and local sources can be developed.
- Costs for the distribution of conventional audio-visual films can be expected to diminish when those prints in heavy demand are televised rather than projected on conventional machines in the classroom. Fewer prints are required, less handling and renovation by audio-visual personnel are needed, and less transportation expense is incurred.

The foregoing are statements of the positive effects which the proper use of TV in the instructional system can help bring about. The improper use of TV, however, can diminish the effectiveness of instruction. It cannot be overemphasized that positive effects can be ensured only when the use of TV in instruction is predicated on (1) a thorough analysis of educational need; and (2) an accurate assessment of the ability of television—and of other media as well—to meet that need.

[1] For specific information concerning staff organization and the effects of utilization techniques on student achievement, see Lindy Wade, *Recommendations Regarding the Use of TV in School Classrooms in Santa Clara County, California.* San Jose, Calif.: Office of the Santa Clara County Superintendent of Schools, 1964 (mimeographed).

CHAPTER 3

Broadcast Instructional Television

Broadcast television is "over the air" transmission of programs, the same type of programs viewed on conventional television receivers at home. Broadcast television for use in public schools is transmitted by regular commercial television stations as well as by educational television stations. The programs broadcast by educational television stations can be received on home sets in the same manner as the programs of commercial stations.

Educational television stations operate very much like regular commercial television stations in that both are licensed by the Federal Communications Commission, and both are assigned specific television channels by the FCC. A major distinction between commercial and educational television stations is that the latter, to be eligible for federal funds, can be operated only by nonprofit educational organizations; educational stations cannot promote the sale, for profit, of products or services. In addition, educational stations are expected to make their facilities available to all of the groups in their areas which are concerned with the education of the public.

Broadcast television—sometimes called open-circuit television—is transmitted on either very high or ultra high frequencies. VHF is the kind of telecasting with which most Californians are familiar because they see it on channels 2 through 13. But if all telecasting in the nation were limited to channels 2 through 13, as the FCC originally had planned, then—because of the interference of adjoining stations—there could be only a few hundred stations throughout the country for both commercial and instructional uses. Therefore, in 1952, the FCC allocated an additional set of channels for stations which would telecast in the UHF range (see page 3).

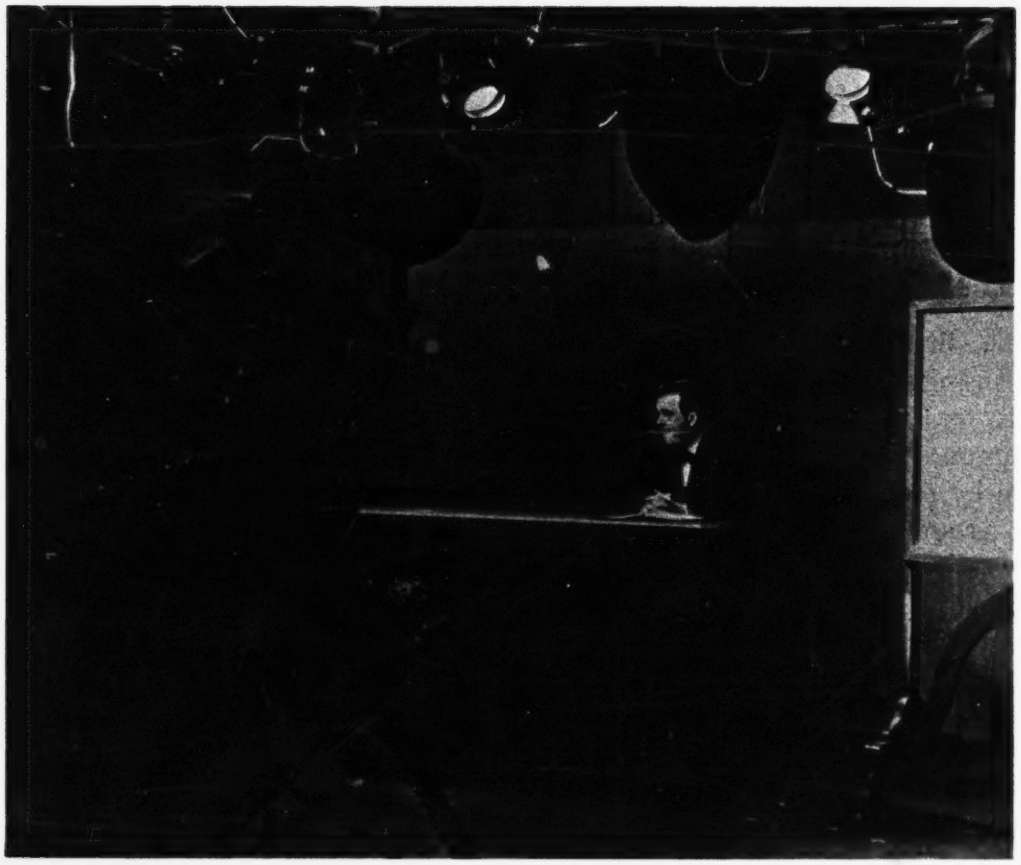
Television stations in the UHF broadcast band appear on the dial of a receiver as channels 14 through 83, making possible a total of 70 different UHF channels. The value in opening up this new set of frequencies for telecasting is, of course, that now there can be a much greater number of television stations, both educational and commercial. To help stimulate growth of these new channels, all television receivers imported or shipped in interstate commerce and sold in the United States after April 30, 1964, must be equipped to pick up both UHF and VHF stations. Older sets, equipped to receive only the VHF channels 2 through 13, can receive UHF channels by means of a converter.

Both UHF and VHF television transmissions are omnidirectional—that is, ideally, the picture and the sound are sent out from the station in all directions equally as clearly. However, both UHF and VHF television are limited to "line-of-sight" transmission. This means that, other transmission characteristics being equal, a station whose transmitting antenna is situated high upon a hill will reach a larger area than a station which operates from the floor of a valley.

One solution to the problem of telecasting beyond mountains and similar obstacles to light-of-sight transmission is the Midwest Program on Airborne Television Instruction. In the spring of 1961, MPATI began to telecast instructional programs from a special airplane circling over Montpelier, Indiana. The plane carries two transmitters, which telecast on channels 72 and 76. Instruction televised from the plane reaches some five million students in 13,000 schools and colleges in five states—all of Indiana plus parts of Illinois, Ohio, Michigan, and Wisconsin. Although the project cost more than $7 million, engineers claim that the cost is only a fraction of the money that would have been needed for a ground-based television system to reach the same number of students.

EDUCATIONAL STATIONS

Typical of educational broadcast television stations in California are San Francisco's KQED, Channel 9, California's oldest educational station, which began broadcasting in 1954, and Sacramento's KVIE, Channel 6, which began broadcasting in 1959. Both of these stations broadcast programs of community interest as well as instructional programs for public schools. The instructional programs are paid for in various ways, either according to the number of individual student viewers, as KQED is paid, or according to the total number of students in the district, as KVIE is paid. These two stations are owned and operated by nonprofit corporations of citizens. Both can be called typical community educational stations. Other noncommercial educational broadcast stations operating in



A biology lesson is recorded on video tape for future scheduling at San Bernardino Valley College. A student majoring in TV mans the viewfinder camera.

California are Station KCET, Channel 28, in Los Angeles, and Station KIXE, Channel 9, in Redding. Both began broadcasting in 1964.

PUBLIC-SCHOOL-OWNED STATIONS

Typical of another more recent California development is KVCR-TV, Channel 24 (UHF), owned and operated by San Bernardino Valley Junior College at San Bernardino. This station is the first public-school-owned and -operated broadcasting television station in California. It began broadcasting instructional programs in 1963. Some of its programs are used by its own college students, viewing instructional programs in their homes or at the college. Other programs are beamed to public elementary and high schools in the area. When Assembly Bill 9 was passed in extraordinary session of the California Legislature and became law in August, 1963, $30,000 of state funds for each of two years was allocated to be used in direct support of instructional television as a pilot project. The number of students signed up to receive instruction by television in the pilot project increased from 50,000 in the 1962–63 school year to 84,000 in the 1963–64 school year. Most of the programs used in the pilot project were programs beamed by Station KVCR-TV.

The strong and interested leadership of the President of San Bernardino Valley College and the San Bernardino County Superintendent of Schools has made possible a coordinated effort for the development of this broadcast facility. One of the purposes of Station KVCR-TV is to train the junior college students as television technicians, thus making it possible to operate the station more economically than an ordinary commercial or noncommercial station.

San Mateo Junior College began televising in 1964 from Station KCSM-TV, Channel 14. In many ways its operation is similar to that of San Bernardino Valley College in that operating costs are minimized by use of trainees from classes in television technology at the college, and like San Bernardino Valley College's, the station is public-school-owned and -operated, the second station of this kind in California. Both stations utilize extensive closed-circuit facilities within the confines of the colleges.

COUNTY-OWNED STATIONS

Another interesting station organization is that of KTEH, Channel 54, in San Jose. This station is owned and operated by the government of Santa Clara County. The Santa Clara County Superintendent of Schools is the general manager of the station; the technical operator and adviser is the County Director of Communications; the station manager is an assistant in the office of the County Superintendent of Schools. Forty-five governmental departments and agencies and 47 school districts are involved in the programs broadcast from this station.

The unique aspect of the Santa Clara County operation is its utilization of the total facilities of the county government. The station expects not only to transmit programs to meet county government personnel training needs, but also and at the same time to transmit instructional programs to public school classrooms. It is planned that program production studios of cooperating colleges and universities will communicate with this station by means of microwave links. At a subsequent time, a mobile camera truck will make possible programs that originate in a variety of locations in the county. Interestingly enough, this station does not plan to operate its own production facilities initially, but to depend on programs, video tape, and films supplied by other educational TV stations in the West, and other sources of programs, such as National Educational Television (NET).

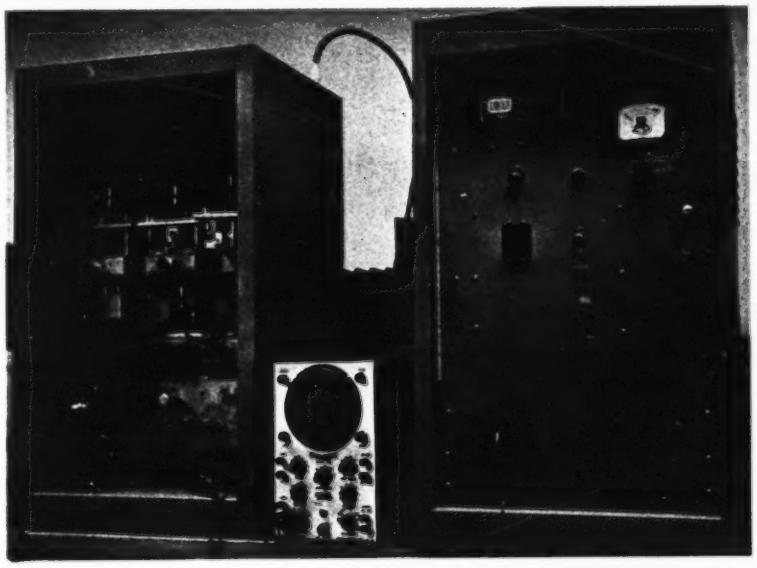
COMMERCIAL STATIONS

In the heavily concentrated population area around Los Angeles, difficulties presented themselves in organizing an educational broadcast television station. One of the early difficulties was that of convincing people to convert VHF receiving sets to receive UHF broadcasts. Not wishing to delay, however, until such time as technical advances would make possible the use of UHF broadcasting, the Los Angeles County Superintendent of Schools held a planning meeting of school administrators in February, 1958, to consider the possibilities of cooperative effort in the field of instructional television. In March, 1958, the Office of the Los Angeles County Superintendent of Schools and six school systems within the county planned and presented live television programs on science. These programs were presented over commercial station KCOP, Channel 13. By June of that year, 16 school districts in Los Angeles County decided to support this instructional television development. During 1959, 60 half-hour instructional programs were produced and beamed from KCOP to districts within the area. A full-time television consultant was hired to coordinate the effort. Thirty participating districts contributed 20 cents per unit of a.d.a. Under Public Law 864, Title III, of the National Defense Education Administration Act, 300 receiving sets and stands were purchased by school districts to receive the program. As a result, the student viewing audience increased from 70,000 in 1959 to more than 300,000 in 1964, and the broadcast area expanded into eight counties. In the fall of 1964, programs were broadcast not only from VHF Station KCOP, Channel 13, but also from the newly organized UHF Station KCET, Channel 28. It is estimated that the student viewing population of these two stations was approximately 600,000 for the year 1964–65. Not only technical advances in electronics, but also the "all-channel law" gives assurance now, after several years, that the new UHF station will succeed in reaching a sufficient audience, which was unavailable in the days when UHF first began to broadcast in the area.

RETRANSMISSION OF PROGRAMS

As has been pointed out earlier in this chapter, broadcast television uses a signal transmitted more or less in all directions. The range of this signal depends on the height of the transmitting antenna, its power, the nature of the surrounding terrain, and other factors governing transmission and reception. Consequently, the signal range may be as long as 50 miles or as short as 10 miles.

Sometimes it is necessary to extend the signal coverage of the basic transmitting station to reach receivers at distances greater than normal or to fill in "shadow" areas that do not receive the basic signal because of interference of the terrain. Devices which transmit and thereby extend basic broadcast signals include "translators" and "boosters." Translators and boosters may be licensed by the FCC, with the permission of the basic operating station, to users such as communities or school districts. Microwave and cable connections frequently are used in conjunction with translators to extend signal coverage.



This translator, being tested before installation in Santa Clara County, will pick up programs from KQED, Channel 9, and rebroadcast them over a UHF frequency. Thus, the range of the station will be extended to schools in the southern part of the county which otherwise could not receive KQED's signals.

Most of the educational television stations in California are employing such retransmission devices to extend their signals beyond the normal pattern of basic transmission. Station KVCR-TV, Channel 24, is currently extending its broadcasts via a system of translators leased by the San Bernardino County Superintendent of Schools to more than 95 percent of the school population of the vast county. Station KQED, Channel 9, in San Francisco has for several years been connected to Station KVIE, Channel 6, in Sacramento by means of a microwave link allowing the two stations to trade programs. KQED's signals are extended to cover the southern area of Santa Clara and San Benito counties by means of a translator operated by the office of the Santa Clara County Superintendent of Schools. Signals from this station are also retransmitted into Monterey, Santa Cruz, and San Benito counties by a system of translators operated by the office of the Monterey County Superintendent of Schools. These signals will also be received via translator in San Luis Obispo County.

Extension of the signal of Station KVIE, Channel 6, in Sacramento is accomplished via microwave facilities to Station KIXE, Channel 9, in Redding. These signals are rebroadcast over regular VHF transmission facilities, and permits have been filed with the FCC for further retransmission by translator into Trinity County. It is interesting to note that a number of the instructional programs rebroadcast by KIXE in Redding as a satellite station of KVIE in Sacramento are the product of Station KQED in San Francisco.

The new UHF station in Los Angeles, KCET, Channel 28, reaches a large number of shadow areas principally by means of commercial cable systems. The commercial cable systems frequently donate use of the systems or lease them for a moderate fee.

CHAPTER 4

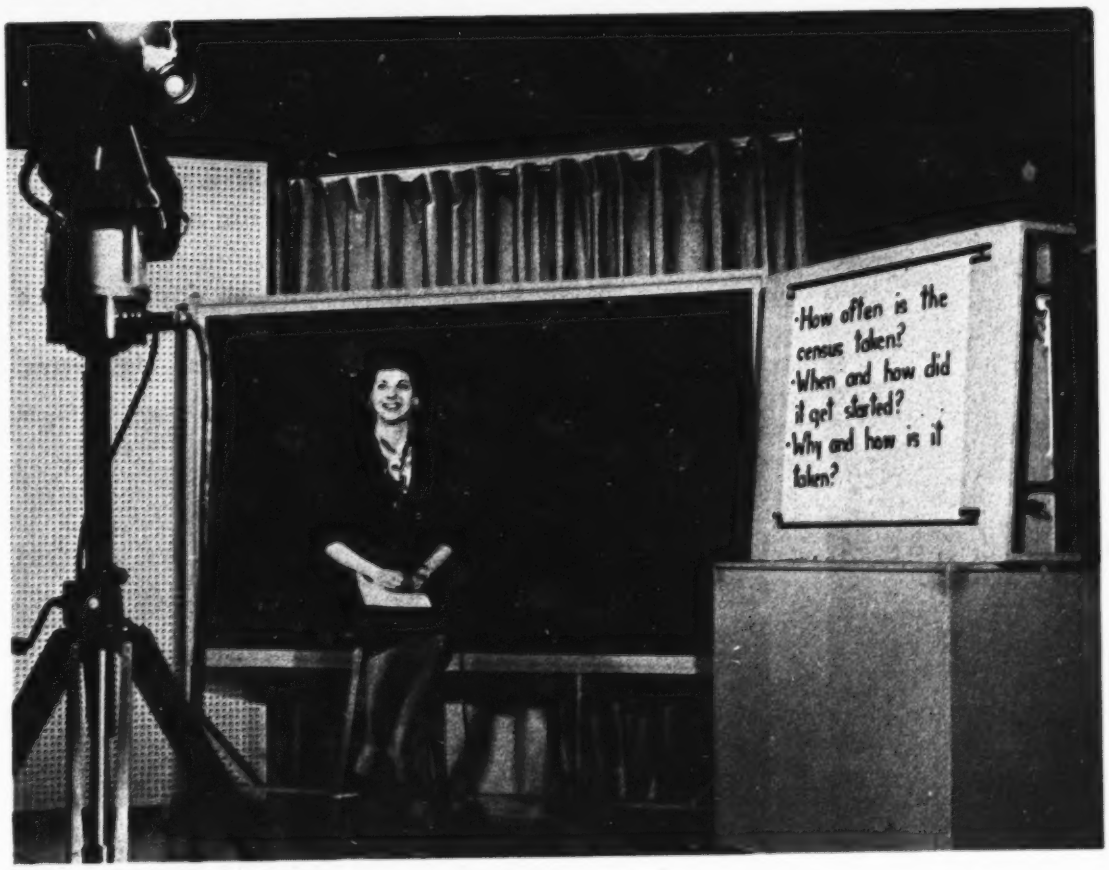
Closed-Circuit Television

Although some closed-circuit television equipment is similar to open-circuit or broadcast television equipment, the basic difference between the two systems is that closed-circuit television signals are transmitted from one location and directly to one—or a few—specific receiving locations and to no others. Thus, closed-circuit television, unlike broadcast television, cannot be viewed on any receiver in the area. Another difference is that the educational organization using closed-circuit television does not have to wait for specific broadcast times but can schedule programs as it chooses.

One method for delivering closed-circuit television is by wire. In this kind of distribution system, the cameras or other originating equipment are connected directly by wire to all of the receivers on which the program is to be viewed. Any receivers in the area which are not connected to the wire cannot, of course, receive this type of telecasting. The particular kind of wiring used is called a coaxial cable. Coaxial cable is a specially designed transmission line consisting essentially of one solid wire within a flexible tube (made of a good electrical conductor), with the inner wire insulated by a plastic sheath in such a manner as to give wire and tube a common axis—hence the term "coaxial." The outside of the cable has additional insulation, sheathing, or covering for protective purposes.

Another important method of delivering closed-circuit television is microwave. The system is unidirectional in that specially designed antennas, called "dishes," concentrate all of the power into a narrow beam that is received by a similar dish at a point some distance away and in line of sight to the transmitting point. Each antenna serves either a transmitter or a receiver. This system is sometimes called point-to-point transmission.

Although this transmission system is broadcast and must be authorized by the FCC since it does go out over the air, it is not an open-circuit broadcast system because it cannot be received by any receiving set in the area—only by the antenna at a specific receiving location. Since it is a highly directional system, should

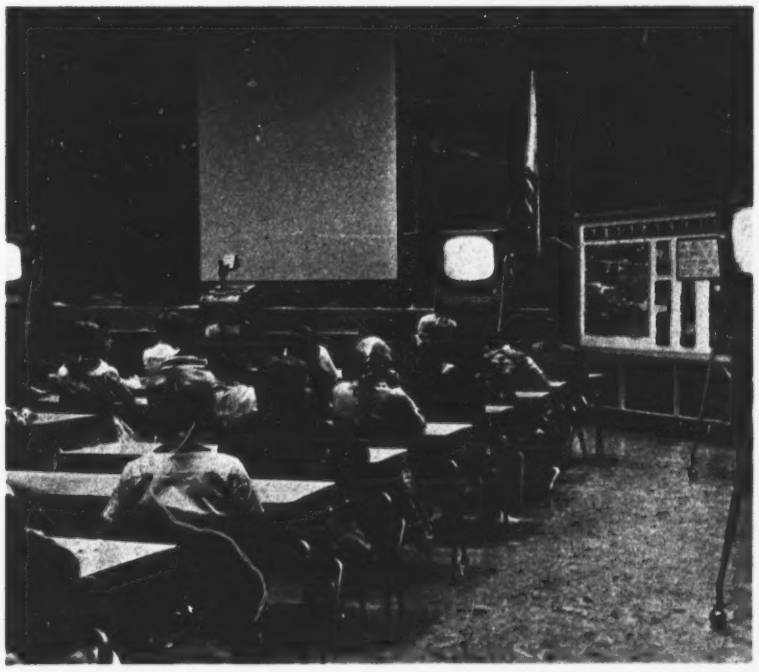


The position of "television teacher" is full time. This teacher spends much of her time helping to prepare teachers' guides, programming graphics and films, and meeting with regular classroom teachers as well as teaching in front of the camera.

Facilities for major television productions require space. This building at Anaheim houses several studios.

there be a change in the location of either of the terminal points, the special antennas must be realigned. Being a line-of-sight transmission system, single microwave links usually cover distances of not over 50 miles each, depending on the terrain and the height of the antenna; longer distances are spanned by establishing additional receivers and transmitters between the end points. (Most cross-country telephone calls are now carried by microwave relays.) At the pleasure of the FCC, more than one channel may be assigned to make possible simultaneous multiple-program transmission between connected sites.

The other method for delivering closed-circuit television without cables is a recent development known as instructional television fixed service (ITFS), or 2500-megacycle multichannel television, or low-power television transmission. This method, like microwave relaying, is a broadcast system and can be operated only with the authorization of the FCC, but it is considered to be closed-circuit television because it is another type of point-to-point, directional telecasting. It differs from microwave in that its transmitter is omnidirectional but only highly directional dish or "corner" antennas pointed directly at the transmitter can receive the signal. Up to four programs may be transmitted simultaneously via this system, if appropriate equipment is provided and the necessary channels are assigned by the FCC. (There are actually 31 channels available, but only four may be assigned to any one school district.) The signal range of this equipment is 15–20 miles, depending upon terrain, antennas, and locations. It is limited to line-of-sight transmission-reception. Experimentation was done with this type of installation at Plainedge, New York. The results were found to be quite acceptable. It is thought that some economies may be derived by use of this system



Anaheim pupils spend half their day in resource room, which has many A-V resources to supplement TV; the other half, in "skills" classrooms.

where tall buildings and hills do not present interference.

INTERSCHOOL CLOSED-CIRCUIT SYSTEMS

Among the major closed-circuit television installations in the United States is the complex at the two cities of Anaheim and Santa Ana, California. In 1959, after careful planning, Anaheim City Elementary School District connected 12 of its schools with coaxial cable, built a multistudio production center, planned classrooms for a unique "redeployment plan" for teachers, hired a television director, a corps of television teachers, a production manager, a curriculum consultant, and were in the business of teaching pupils in a number of their fourth and fifth grade classes by television.

Within six years, all of Anaheim's 22 elementary schools were receiving programs from the central studio. More than 9,500 Anaheim pupils in grades three through six receive televised and related classroom instruction. Approximately 6,500 pupils receive television programs in self-contained classrooms. These are conventional classrooms housing one teacher and 30 to 35 students. Approximately 1,200 fifth and sixth grade pupils receive television programs and related teaching in the redeployment plan in eight of the 22 connected schools. The number of pupils taught in each redeployment area in each school is 150. In the morning 75 of them receive television lessons and related instruction from two teachers in the large audio-visual resource room. The subjects are social science, music, science, conversational Spanish, physical education, art, health and safety, and fire prevention. At the same time, in three small classrooms (the skills classrooms), individual teachers instruct groups of 25 in the basic subjects of reading, arithmetic, spelling, handwriting, and written and oral language. In the afternoon, the procedure is reversed.

It is claimed that the redeployment plan answers one of the perplexing problems which has concerned elementary schools for many years—the problem of providing small pupil-teacher ratios for teaching the basic "three Rs" without greatly increasing the per-pupil cost and the need for many additional classrooms. It is also claimed that by diminishing the teacher's subject matter work load, the redeployment plan allows him to prepare and become more proficient in those subjects which he does teach. The large-class approach promises to make use of skilled teachers in science and social science by combining their teaching strengths in a team-teaching approach. Testing indicates that the pupils taught in small skills classrooms do better in basic subjects than pupils in conventional-size classrooms, while those taught by television with appropriately planned instructional activities in the large audio-visual resource rooms do equally well as those in conventional classrooms.

Neighboring Santa Ana Unified School District recently retained a corps of planning consultants under whose guidance it developed a closed-circuit production center. The center, which consists of five production studios with television origination equipment, including video tape recorders, film chains, and the like, is connected with 23 elementary schools, four junior high schools, two high schools, and one junior college. Appropriate curriculum consultants, television teachers, and production staff have been hired. The production centers of the two school districts (Anaheim and Santa Ana) are connected to consolidate cooperation in production and transmission of lessons to classes. It is estimated that more than 42,000 students have received instruction from these centers during the 1965–66 school year.

A simpler closed-circuit system is located at the Lafayette Elementary School District in Contra Costa County. In this district, ten schools are connected to a central studio by coaxial cable. The local telephone company installed and maintains the cable system. The personnel employed for this system are a television coordinator, a full-time technician, two full-time teachers, and a half-time secretary. The studio building is small but well designed, and the camera equipment is of the best vidicon types available. The control room is complete, including two $12,000 video tape recorders and a film chain. The reasons for this type of installation were (1) difficulty of reception of broadcast

Stored here, video-taped programs can be played at convenient scheduling times and replayed indefinitely.

programs or the use of microwave or low power in a complicated, hilly terrain; and (2) a desire to make use of outstanding available language teachers to comply with the mandatory legislation concerning foreign language.

An interesting closed-circuit television program has been under way for four years in the Lennox Elementary School District. Purchasing inexpensive television cameras and a film chain, this school district has been able to transmit the teaching of a master science instructor to the five schools in the district, all connected by coaxial cable. Lennox is unusual in being able to use city power poles for carrying its own coaxial cable from school to school, thus avoiding the extra expense of rental from a common carrier.

INTRASCHOOL CLOSED-CIRCUIT SYSTEMS

A typical secondary school closed-circuit television installation is that in the Fremont Union High School District in Sunnyvale, Santa Clara County. This installation had its beginning as a pilot project at Cupertino High School, where 52 instructional areas initially were interconnected by means of a multichannel, closed-circuit coaxial cable system. Programs originated within the school's central control room, which houses a film chain including a static vidicon camera, a 16-millimeter television film projector, and an automatic slide projector. Also included in the basic equipment are two viewfinder vidicon cameras and a rollaway console, which includes monitors, switcher-fader and RF (radio frequency) modulator. The cameras and console can be rolled from the central control room to any one of the 52 instructional areas to produce programs which then are received in any of the other classrooms. An array of several antennas to receive programs broadcast from local VHF and UHF broadcasting stations was fed into the "head end" of the system housed in the central control room.

At first, a part-time TV coordinator was made available as program director. A technician from the central audio-visual department served to maintain the equipment and train student technicians.

The teachers and the administration at Cupertino High School are convinced that television does aid in instruction, and they have discovered a number of uses for it. A few of the subjects in which the program has been used are science, mechanical drawing, homemaking, and woodworking.

Currently four more high schools in Fremont Union High School District are equipped with multichannel, closed-circuit systems, which duplicate the facility at Cupertino High School, and the program has been extended into the areas of guidance, English, foreign

A television teacher dubs as cameraman while television director and an engineer control the video tape recording of a Spanish lesson, which is shown to sixth grade classes in Lafayette Elementary School District, Contra Costa County.

In Fremont Union High School District, closed-circuit ambulant equipment brought to the classrooms allows one class to view safety precautions in the use of a radial saw and another to see mechanical drawing techniques.

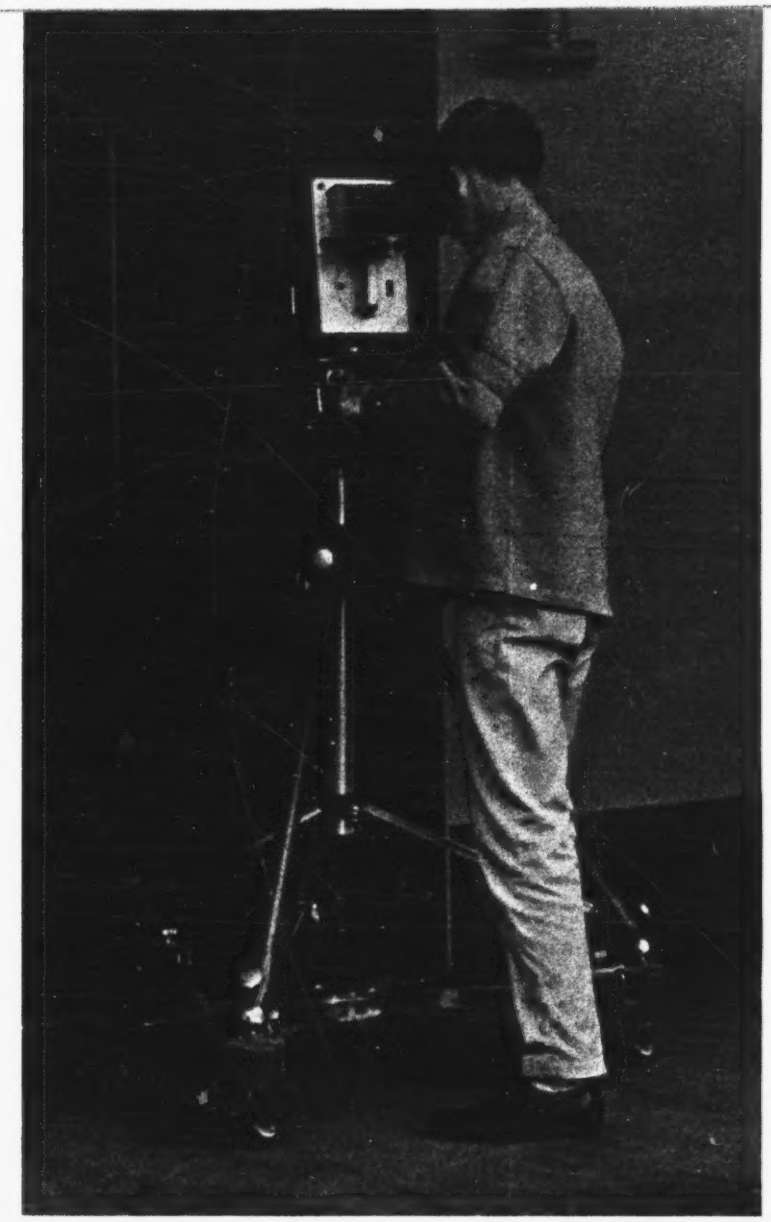
language, art, driver education, social science, and current news of importance from broadcast stations. More than 10,000 students receive some televised instruction every week. Each school's television schedule is programmed by a full-time television coordinator. A full-time technician is assigned to each school to maintain the equipment and to supervise the training of student technicians in television who serve as cameramen, audio men, property men, and so forth, in the school's television program. Also each school has a half-time certified audio-visual coordinator and a half-time clerk. These personnel work closely with the television coordinator.

Six video tape recorders have been added to Fremont Union High School District's equipment, thereby making replay possible and consequently allowing for much greater flexibility in scheduling and expansion of programs. Although each of the district's four high schools has television facilities of essentially an intraschool type, the video tape recorders make possible an exchange of programs. What originated in one classroom can now be replayed not only in any other classroom within one school, but also in any classroom of any of the other three schools. In a sense, it can be said that the tape recorders have made possible an interschool linkage by the exchange of tapes. In the long range plan, however, the schools of this district will be linked by cable, fixed service (2500 megacycle), or microwave.

The trend in the secondary schools of California is toward multichannel closed-circuit television systems which allow a versatility not only to receive broadcast programs—which, of course, are inflexible timewise and make scheduling difficult—but also to

take advantage of the use of film chains, video tape recorders, and ambulant camera chains in order to originate and repeat programs acquired from broadcast or almost any other sources, such as video taped broadcasts, kinescopes, 16-millimeter films, and a whole range of audio-visual materials. By means of portable video tape recorders, these materials can be edited or combined into a well-designed individual program or series of programs, which can then be stored and used again and again at the most appropriate times in the complicated scheduling of modern secondary schools.

Systems similar to that at Cupertino High School in the Fremont Union High School District have been installed at the Corona del Mar High School of the Newport Harbor Union High School District, and Troy High School in Fullerton Joint Union High School District. These installations are likewise multi-



Student assistants move a portable control console and a viewfinder camera mounted on a heavy tripod and dolly to a classroom studio program production in Fremont Union High School District.

channel, with video tape recorders, film chains, portable origination cameras, and consoles, and interconnection of many instructional areas.

Other high schools have less complicated closed-circuit camera systems. These systems range from single-classroom, magnification camera systems to small, three- or four-room, single-channel distribution systems with great potential toward expansion. Systems like these have been installed at high schools in Barstow, Rialto, Placerville, Berkeley, Elk Grove, Hemet Valley, and in the Antelope Valley Union High School District. Antelope Valley's is a well-engineered video system particularly designed for precision viewing in science classrooms.

CHAPTER 5

Equipment and Costs of Instructional Television

Previous chapters have presented an overview of the development of instructional television in California, the characteristics and potentialities of television as a medium of communication, and brief descriptions of some types of television installations currently in use in the schools in California. This chapter attempts to delineate patterns in television system configuration consistent with the needs and uses for television in the public schools of California. It also attempts to present some specific types of equipment and their approximate costs as an aid to school people in making and implementing their instructional television plans.

Most literature on television is organized according to TV functions:

- Origination, which is the production or recording of television picture and sound messages
- Transmission (or distribution), which is the sending of the televised messages from one place to another
- Reception and presentation or display, which concern the methods and devices allowing the transmitted messages to be received and viewed by an audience

Although all of the television systems described in this chapter fit into one or more of the preceding categories, for the purposes of discussion the simplest and least expensive systems will be identified first, with the more complex and expensive systems to follow.

TELEVISION RECEIVING EQUIPMENT

Television Receiving Sets. Television signals that combine pictures and sound normally are received for use in the classroom on receiving sets similar to those used in the home. Classroom television receivers, however, must have capabilities and characteristics not always found in home receiving sets. For example, the minimal specifications should include:

- A diagonal screen measurement of at least 23 inches
- Ability to receive UHF channels as well as VHF channels
- Ability to display both RF and video pictures [1]
- A front-mounted speaker—and a jack for connecting separate loud speakers, if necessary—to deliver clear sound to the full extent of the classroom
- A minimum of 300 lines of resolution for RF and 600 lines of resolution for video
- A glare shade over the receiver, or some other device to reduce glare
- Automatic gain control (AGC)
- A rollaway stand which has casters at least 4 inches in diameter and which will place the center of the picture about 60 inches above the floor for secondary classes and 56 inches for elementary classes and will permit adjustment of the receiver to face slightly downward to eliminate glare
- Shockproof construction
- A power transformer to completely isolate the power supply from the chassis
- A three-wire, grounded power cord

Some manufacturers equip their sets with an RF/video switch, allowing the sets to receive both video signals from a closed-circuit source and normal broadcast signals (RF). However, the adaptation for this capability, called "jeeping," may be done for as little as $2 or as much as $25 or $30, if done after installation. Classroom sets, when purchased in lots of ten

[1] "RF" is an abbreviation for radio frequency. As used here, it identifies *one* method of transmitting picture or picture and sound through space or over a cable. The picture or picture and sound are sent through a modulator and transmitted on a regular TV wave. The use of RF transmissions over a cable permits the simultaneous use of that cable for more than one program. Home TV receivers receive an RF signal.

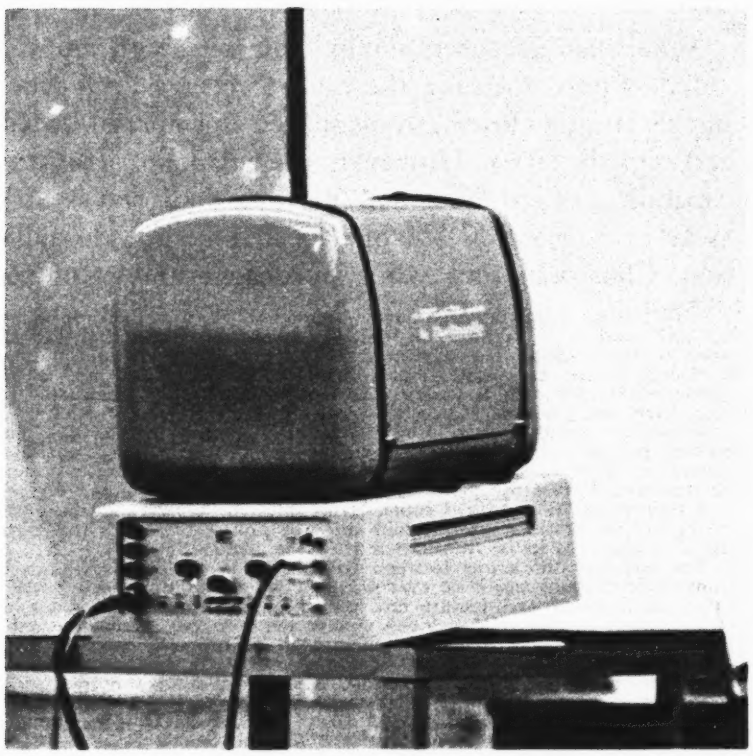
"Video" is another term used to identify another method of transmitting picture only over a closed-circuit line. Under normal operating conditions, a video signal cannot be transmitted through space; it must be transmitted from the point of origin to the point or points of reception over a coaxial or biaxial cable. It occupies the capacity of the entire cable, and therefore, a separate wire must be provided to carry the sound signal if sound is to be transmitted with the picture.

The essential differences between RF and video are these: RF can be transmitted through space or over a cable; video can travel only over a cable. Both sound and picture are carried by the same cable when an RF system is used, while a video system requires that a separate cable be used to carry each. However, where high definition is essential (e.g., where small print must be read or where small-scale demonstrations are to be shown on the TV screen) video is superior, since a normal video system can present 600 lines of resolution at the receiver, while an RF system presents a maximum of 320 lines at the receiver. (Incidentally, home receivers seldom present over 275 lines.)

or more, should cost an average of $175. Extra accessories—such as an RF/video switch, additional speaker outlets, or plug-in jacks for a tape recorder—can increase the total price to as much as $260. A rollaway stand costs about $30.

Some school systems which can receive strong signals from close-by broadcast stations are using sets which receive both VHF and UHF signals on separate antennas; however, when a number of sets are used with a master antenna system which converts UHF signals to VHF, schools may purchase sets which receive VHF broadcast signals only, despite the "all-channel" law (see page 6). VHF sets have some advantages. (See section on Antenna Systems, following.)

Television "Receiving" Projecters. Television projectors, which must not be confused with film chain (16-millimeter) projectors, are another receiving device allowing large groups to view television. Television technology is not advanced enough to make TV projectors appropriate for general school use as yet, but they are useful in large auditoriums where extreme sharpness for viewers sitting close to the screen is not a critical factor. However, in 1966, two of these devices are in use in public schools of California, one at San Bernardino Valley College and one at Cabrillo College. Television projectors are still quite expensive (they cost from $2,000 to $10,000), and their operation and maintenance demand knowledgeable technical personnel.



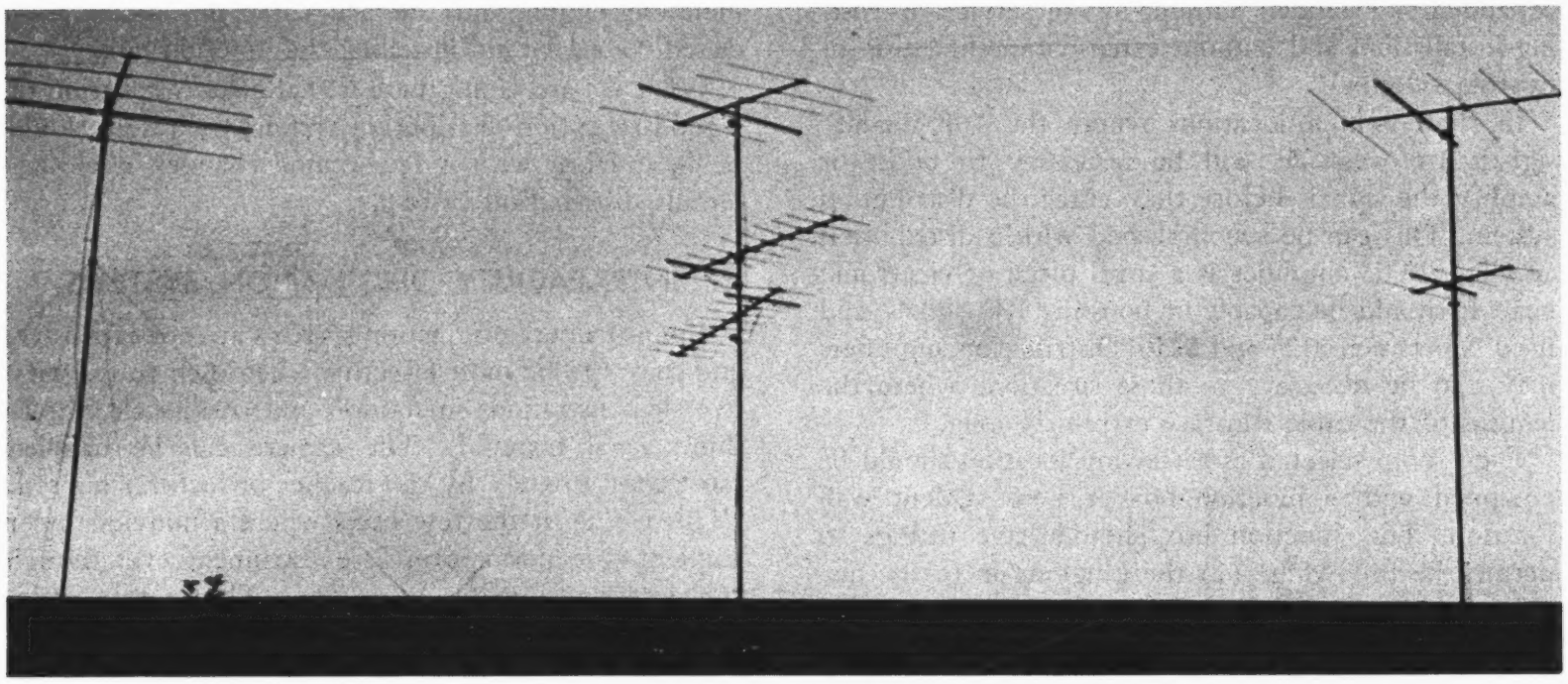
This television projector (not to be confused with a film chain projector) projects large images on a screen.

Video Monitors. Unlike the conventional RF receiving sets, video monitors receive a television picture only. The band width of the signal occupies the total capacity of the coaxial cable, thereby allowing use of a wider band and consequently producing a picture of greater resolution (600 lines) than that permitted on RF (standard VHF) receivers. However, a separate cable or wire and a separate speaker must be used to reproduce the sound. Video monitors cost about twice as much (approximately $400) as conventional receiving sets, and the expense of the speakers and extra cable for the sound system appear to be hard to justify at this time except in special cases, such as photomicrography and reproduction of fine print, in which extremely high resolution is demanded. Therefore, a careful assessment of the total instructional need in terms of expense must be made before deciding on a video system for distribution.

Antenna Systems. The antenna system is usually erected on the roof of a building to catch the RF signals emitted by a TV station's transmitter a number of miles away. For the purposes of this discussion, this system includes a UHF-VHF and a 2500-megacycle converter, where necessary. The height and general construction of the antenna system depend upon the distance between the transmitter and the receiving antenna location and line-of-sight considerations. In general, the farther from the transmitter, the higher the antenna should be. All antenna arrays should be equipped to receive VHF signals (channels 2-13), UHF signals (channels 14-83), and where necessary, 2500-megacycle signals. (Obviously, if the only station in an area was a VHF station, the only antenna array necessary on the mast would be a VHF antenna array.)

One UHF converter per UHF broadcast signal received (and a 2500-megacycle converter per four channels where necessary) should be added to the antenna system. The UHF converters should be able to discriminate between adjacent channels from 14 through 83. They should cost between $90 and $250, and the 2500-megacycle converters cost between $500 and $1,000.

The purpose of any converter is to convert a UHF or 2500-megacycle frequency signal to permit its reception and display by VHF receivers, which are at present superior to UHF receivers. For this reason, and the fact that there is considerable signal loss when UHF is distributed directly, better reception quality is provided by having a single unit per transmitting station convert the UHF signals (and one 2500-megacycle converter per four channels) to VHF than to



Antenna arrays oriented toward each station are desirable to receive a number of broadcast channels.

have these signals tuned and converted at the individual set. Concerted effort on the part of equipment manufacturers may be expected to improve the quality of UHF sets and signal distribution techniques soon. These technological advances may then allow for reception and distribution in one master system of the complete scope of 82 channels included in both UHF and VHF broadcasting.

Only one antenna support is required per building or per campus in the normal situation. Only one converter per UHF channel (one 2500-megacycle converter per four channels) will be required per building or per campus where a master distribution system is utilized.

Reception-Distribution Systems. The term "reception-distribution system" refers to the system of coaxial or biaxial wires which takes the signal from the reception antenna (or origination device) and distributes it to viewing locations within rooms of a building. A distribution system can also interconnect several buildings. And it is recommended that nearby buildings on a single campus be so connected.

The interconnection of widely separated buildings of a school district is not recommended at this time except in instances of well defined need. Districts should contemplate this step only after thorough study. The 2500-megacycle system for low-power transmission of multiple programs through the air is available now, but it is expensive and it is not packaged in the most appropriate form for schools. When the packaging of the equipment is further refined, it will make low-power, multiple-channel broadcast service by districts to most school sites possible and feasible. And, it is possible that the cable companies and other common carriers will offer more attractive rates for nonbroadcast services in the face of the competition offered by the 2500-megacycle system. However, it is not yet time for districts to interconnect widely separate school sites unless there is solid justification and strong indication that the use of the system will be heavy enough to warrant the expenditures for the equipment and its operation.

What is appropriate for school districts and educational institutions to contemplate at this time in terms of television? It seems important that they enter the field by planning and installing good quality, solid, reliable systems for receiving, distributing within buildings, and displaying broadcast TV programs from VHF-UHF and any other proposed local instructional TV service such as intrabuilding film/video tape origination. There is little doubt that school districts will need to interconnect school sites in the future, when the systems are priced and packaged appropriately. However, if individual buildings are provided with the type of reception, distribution, and display systems suggested herein as a first step, the problem of interconnecting buildings as a second step in the future will be simple and, by then, more feasible.

Building distribution systems should be capable of (1) carrying both video and RF signals without major modification after installation; (2) carrying up to 12 different RF programs simultaneously; (3) carrying the signal to the most distant viewing location in the system without appreciable loss of signal; (4) being

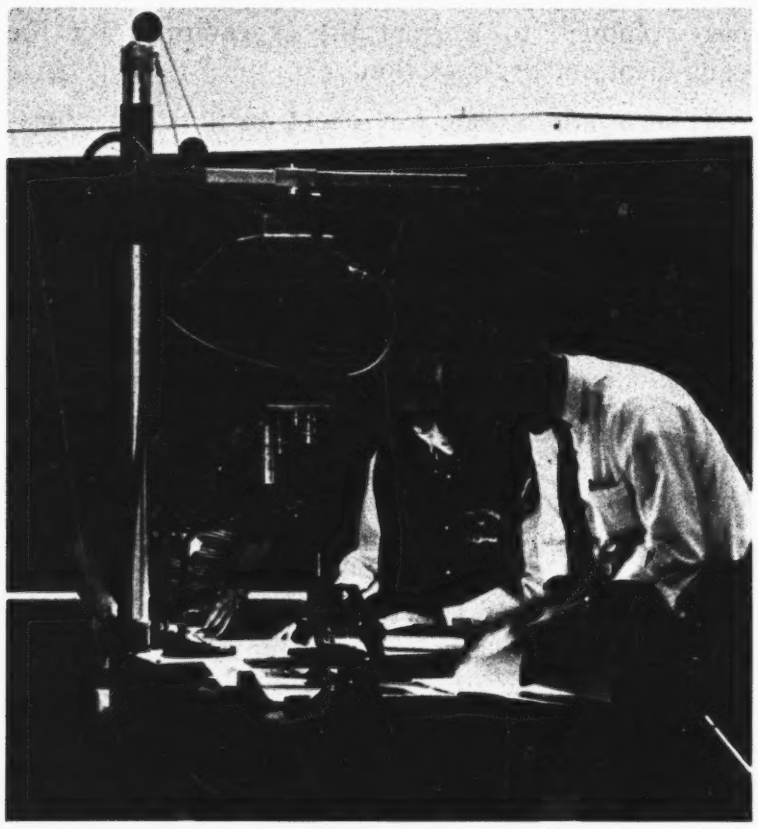
expanded or extended without loss of service to existing installations and without extensive modification of existing systems

In those school locations where the "off-the-air" signals are weak, it will be necessary to boost or amplify the signals before they enter the distribution system. This can be accomplished with a distribution amplifier. The amplifier is a small piece of electronic gear. It should be capable of boosting RF signals, and it costs between $125 and $250. Distribution amplifiers may also be necessary in those situations where the lengths of the cable runs are extremely long.

Each room selected as a viewing location should be equipped with a junction box at a convenient wall location. This junction box should have fittings to permit the following: (1) the plugging-in to the distribution systems of at least two receivers; (2) the reception of either RF or video and audio signals; (3) the plugging-in of television cameras for the live origination of programs in the room and their transmission throughout the system; (4) the inclusion of an intercommunication circuit; (5) room for expansion; and (6) self-termination and automatic balancing.[2] After the main trunk of the distribution system is installed, it costs approximately $50 to wire each viewing room, including tapping into the main cable, purchasing associated materials, and installing the junction box.

What we are saying here is that after installation of a good reception-distribution system, the result should be in essence, with a few minor changes, a closed-circuit distribution system.

[2] Not all of these features need to be included in the system at the outset of operation or in most installations in kindergarten and grades one through six; however, the capacity to permit sequential additions without major modifications must be present in the initial installations.



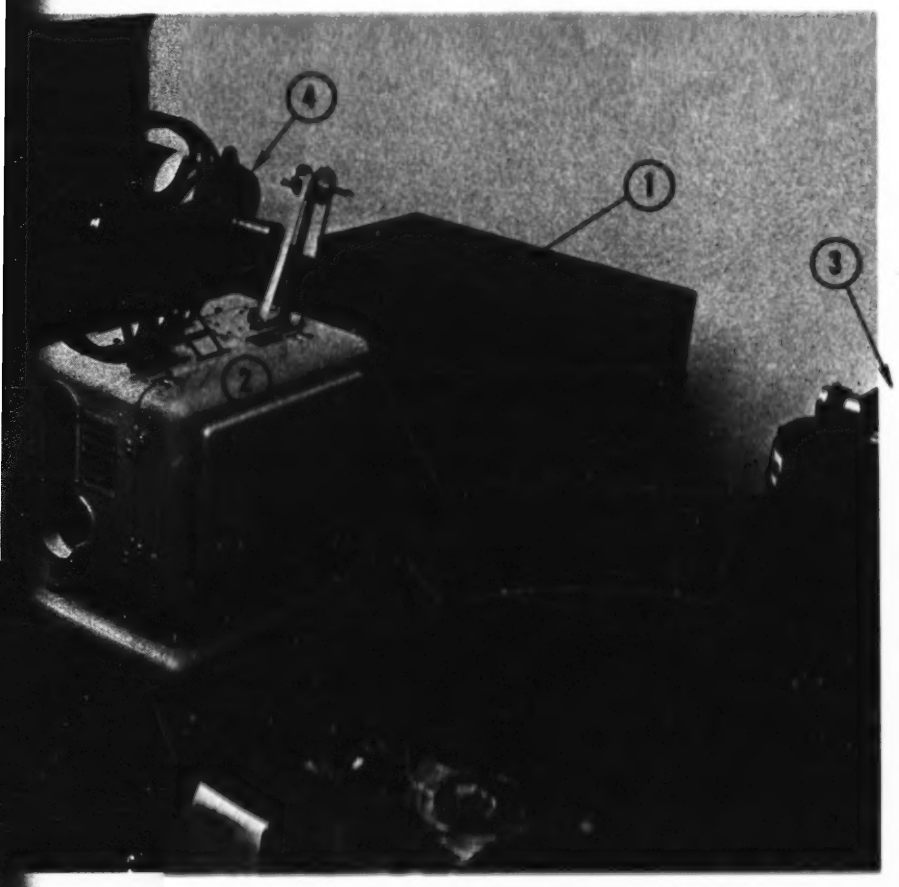
Student assistants prepare materials for an instructor to photograph with an overhead camera and display on television to a large class at UC, Santa Barbara.

INTRAFACILITY ORIGINATION SYSTEMS

Simple camera origination systems are not expensive, and they can be most effective when used to magnify live demonstrations in motion and small-scale, three-dimensional materials. The camera can be handled most appropriately by the teacher or lecturer himself. (This is one of the few cases where a nonviewfinder camera is the most appropriate instrument, even though the potential operator is on site.) This system is designed to serve viewers within a single room. Most secondary schools and many elementary schools which include large numbers of demonstrations in their instruction can justify the purchase of a TV magnification system. Various examples of possible subject uses in secondary schools include chemistry (experiments), physics (demonstration), drafting (drawing skills), and music (instrument fingering). Examples of possible use in elementary schools include skill demonstrations in art by teacher and pupils or the sharing of work samples simultaneously with all pupils in the class, with the teacher directing attention by pointing under the camera to various important facets.

The camera should be provided with a manually controlled zoom-type lens (25-100-millimeter lens at a cost of $325, or some comparable instrument) with a 2-millimeter closeup adapter. Normally, the camera is mounted on a simple pipe rack over the lecturer's head. From there, it can photograph all objects on a desk, demonstration table, or in the lecturer's hands. The system should also include an alternate mount, consisting of a floor tripod on a dolly. The placement of the camera, overhead or on the floor, is determined by the nature of the demonstration. The cost of the overhead mount should not exceed $50 (if it is fabricated in a school district's own shop). For a simple setup for a small camera, the tripod mount, complete with dolly and pan head, should cost between $150 and $250.

In a limited number of cases, it may be desirable to add a second camera (this time on a floor tripod-dolly and equipped with a viewfinder) to the overhead magnifier. With this second camera, a switch ($25–$50 for a small mechanical switch or $1,200 and up for a switcher-fader) to permit the lecturer to change the TV view from one to the other, and a modulator



Film chain (left), remotely controlled at the console, can originate motion pictures and slides. The multiplexer (1) guides pictures from the motion picture (2) or slide (3) projector into the static camera (4) for transmitting directly or to a video tape recorder. A simple film chain is shown below.

($750), it is possible to transmit a complete lesson beyond the walls of a single classroom over the building distribution system.

The camera or cameras used with either system should be capable of transmitting either a video or an RF signal, preferably both. (RF cameras require an audio adder if fed to other rooms.) Demonstrations requiring high resolution will require video cameras; however, most communication situations do not require more than the 300–400 lines of resolution possible with an RF camera. In any case, an RF camera should present 400 lines of resolution and a video camera should present a minimum of 600 lines. Either camera should be able to present an acceptable picture with a lens opening of 2.9 at a light level of 10 footcandles. Under these conditions, there should be no noticable image lag. It is probably not mandatory that the cameras meet Electronic Industries Association synchronization standards, since either the overhead or self-directed TV system would be used strictly for closed-circuit purposes within a single classroom, a single school, or a single campus. However, schools or districts contemplating studio or broadcast systems in the foreseeable future should specify EIA standards for origination equipment at the outset. (Several companies now offer cameras which can be converted from closed-circuit standard to broadcast standard EIA "sync" by plugging in one or two additional circuit boards. This might be a desirable camera feature for schools that plan to begin with closed-circuit service and develop, sequentially, a broadcast service.)

Film Chains. A TV film chain consists of a motion picture projector (with special adaptation of the film pull-down mechanism) and slide projector, which are placed so that they project into a small, permanently mounted TV camera. The camera, in turn, sends the signal into the distribution or transmission system. A typical film chain costs between $3,500 and $7,500. Commercial TV stations use a film chain to present movies late at night.

Experimenters tried using a conventional unadapted film projector as a film chain component for a closed-circuit system. It proved to be very satisfactory. (If it is possible to use a conventional projector as part of a closed-circuit TV film chain, a conventional projector will lower the cost considerably: it costs only $700 in contrast to the film chain, which costs up to $7,500, plus camera control.) It should be pointed out, however, that conventional classroom-type 16-millimeter projectors are not meant for continuous running, and that if films are to be distributed on a daily schedule of several hours' duration that heavy duty projectors costing approximately $2,000 should be specified. If a school TV system has a film chain, it

Recently developed, video tape recorders have the capacity to record, store, and play back information, making possible economy of production and effectiveness in utilization as well as convenience in scheduling.

can be used to distribute regular materials from the audio-visual library. Such a system offers considerable attraction under certain circumstances (over conventional classroom film projectors) in terms of (1) economy of distribution (in broadcast situations); or (2) convenience in use (in closed-circuit situations).

It is usually desirable to add a slide projector to the film chain. The slide projector is usually mounted at a right angle to the TV pickup camera. The slide image is directed into the TV camera through a system of prisms or mirrors, called a multiplexer, which makes this right-angle projection possible. When not using the slide, the multiplexer passes the motion picture image directly through and into the TV pickup camera. The slide projector ranges in cost from $500 to $1,000. A multiplexer costs $1,680 and up.

Video Tape Machines. A video tape machine works on much the same principle as an audio tape machine; that is, it records and plays back, or simply plays back, images and sound on magnetic tape. Standard-size video tape machines range in cost between $40,000 (black and white) to $65,000 (color). Smaller, so-called portable video tape machines which meet FCC broadcast standards range in cost between $14,500 and $22,000. Portable machines currently on the market which meet closed-circuit standards range between $8,000 and $12,000. Both of these broadcast and closed-circuit portables weigh about 68 to 150 pounds. Recently, several domestic and foreign firms have introduced to the market small closed-circuit machines which use ¼-, ½-, or 1-inch tape. These machines reportedly sell for $1,250 to $4,000. (See Chapter 6 for further discussion of these less expensive television tape recorders.)

Video tape devices offer advantages in terms of (1) economy and quality of production; (2) economy of distribution; and (3) convenience in program use. In addition to the programs which can be produced locally with video tape, hundreds of high-quality ITV courses on all grade levels and on a wide variety of subjects are available from the large regional and national libraries. These taped courses can be rented and played back over a district recorder-distribution-display system. Use of the materials, where appropriate, can trim local production budget materially.

When distribution and display systems are contemplated, the addition of a video tape machine as an originating source is highly desirable. When local production facilities are contemplated, the inclusion of a video tape facility is mandatory if true quality and efficiency are to be achieved. (When used in distribution systems, a good modulator must, in most cases, be added to the tape machine at a cost of approximately $750.)

INTERFACILITY ORIGINATION SYSTEMS

At least one institution in a county or region may wish to provide a first-class broadcast and closed-cir-

cuit origination facility. It should be of sufficient size and sophistication to permit the mounting of any kind of local program required. Such a facility costs between $40,000 and $150,000 to equip, and costs for housing and staffing are additional. Annual operating budgets for such a facility range between $40,000 and $200,000, depending upon the size of the facility and the number and scope of the productions.

In brief, a broadcast studio has at least two high-quality floor cameras with viewfinders ($7,400 for vidicon cameras and $20,000 for image orthicon cameras), a film chain ($5,000–$7,500), associated sound equipment (cost not projected), control booth (cost not projected), and video tape machine ($14,500–$34,500). All equipment for this facility must meet EIA standards and FCC requirements.

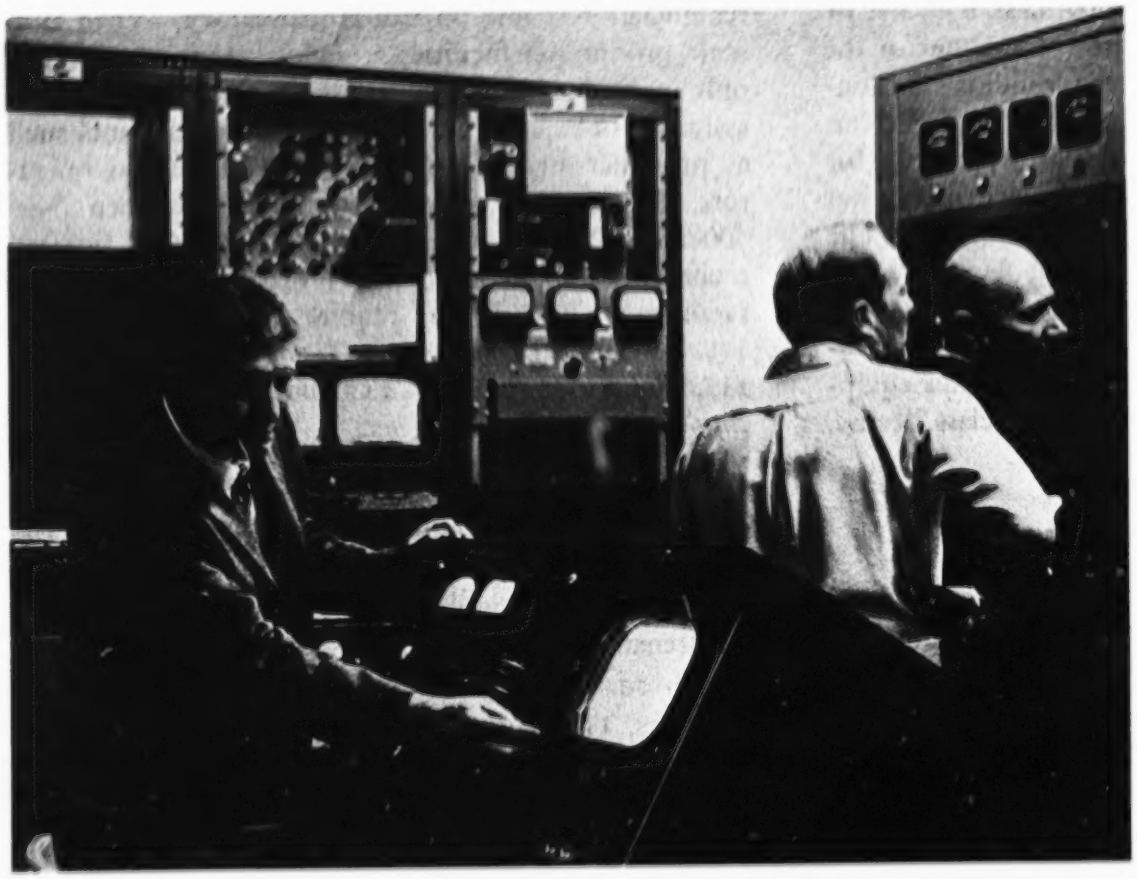
Broadcast Systems. A broadcast system accepts information from the origination system, converts it to broadcast waves, and transmits it in a more or less omnidirectional pattern to receiving antennas at school sites. Equipment items in broadcast systems include a broadcast antenna, transmitter, transmitter control, and associated test and monitoring equipment. It should be capable of placing a 500-microvolt signal on any receiving antenna in the primary coverage area.

Broadcast transmitting equipment is expensive. The transmitter, control system, test equipment, and monitoring equipment for a 1-kilowatt device costs approximately $60,000. A 25-kilowatt device and associated equipment will cost approximately $236,000. The broadcast antenna, depending on size and construction, will cost between $5,000 and $25,000.

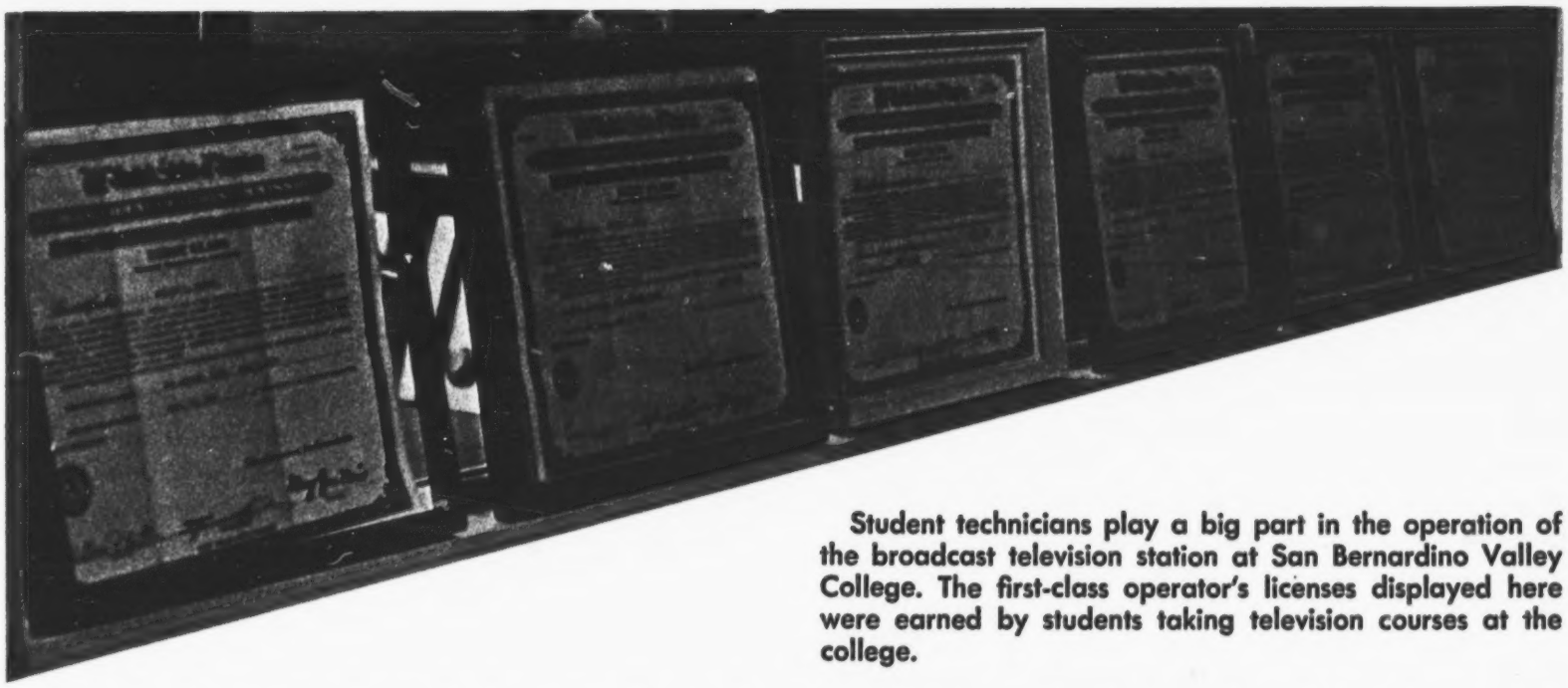
Housing for a transmitter requires a minimum of 1,600 square feet, and, because of the heat generated, the transmitter area must be air conditioned for the good of the equipment. FCC regulations require that an engineer with a first-class license be in attendance at the transmitter controls whenever it is in operation.

Retransmission Systems. Translators are used in conjunction with broadcast systems to extend the signal coverage a greater distance, or to fill in shadow areas in which the basic signal is not received due to interference of terrain. A 100-watt translator will cost approximately $8,500 to $13,000, including antenna and associated gear. Costs of site acquisition and development, and installation, will probably raise the cost by $2,000 to $3,000. Translators must be licensed with the FCC, and the operator should receive permission from the basic transmitting agent before so extending signals. An engineer need not be in attendance at the retransmission site, but the FCC requires appropriate periodic maintenance and monitoring.

Closed-Circuit Systems. Interconnection via microwave costs approximately $10,000 to $15,000 per link ($5,000–$7,500 per site) for the first channel and $1,000 per link (connection between any two line-of-site points) for additional channel modules. FCC regulations require that an engineer with only a second-



Operating engineers at station KVCR-TV, San Bernardino Valley College, check out transmission equipment before a broadcast. Salaries for technical personnel like these are one of the large continuing costs of a major television facility.



Student technicians play a big part in the operation of the broadcast television station at San Bernardino Valley College. The first-class operator's licenses displayed here were earned by students taking television courses at the college.

class license be in attendance during operation, and remote operation is acceptable.

For 2500-megacycle, low-power broadcast television transmission, required equipment at the transmitter location includes (at the present time) one transmitter instrument per channel, transmitter controls, and associated test and monitoring equipment. The transmitter antenna mast is relatively short (to help limit the distance to the horizon and thus limit the range and danger of interference with adjacent instructional fixed installations). Required equipment at the receiver location includes a relatively tall antenna mast, a corner or dish antenna, and a special converter. Once out of the converter, the signal is fed into the building distribution system and displayed on a regular TV receiver. At the present time, the transmission apparatus for this fixed service system is relatively expensive, but it costs less than regular UHF-VHF equipment. The transmitters cost between $10,000 and $15,000 each. The master receiving antenna and converter for each school site cost between $500 and $1,000. FCC regulations require that the engineer who attends this equipment during operation have only a third-class license, and remote operation is permissible.

CONTINUING COSTS

There is a tendency to underestimate or disregard the continuing costs associated with the operation of a school TV system. Actually, the capital outlay for equipment is small in comparison with the continuing costs of operation and maintenance.

Operational Costs. Operational costs are of a continuing nature. TV systems do not operate themselves. The main operational cost is for salaries of personnel. The system which requires the smallest investment in personnel is the simple antenna-distribution-reception system. Depending upon the dimensions of the system, it might be possible to contract with private vendors for equipment servicing. However, a large school district with a sizable system would probably want to have at least one full-time repair technician at a salary of $6,000–$7,000 a year. When simple origination systems such as the overhead TV camera or a tape film chain central are added, having an operation and repair technician available on call is mandatory. When full-scale production facilities are added, they require not only a skilled operating engineer with at least one assistant for repair, but also production personnel such as producer-directors ($7,000–$10,000), audio operators ($5,500–$7,000), switchers and cameramen ($4,500–$6,500), floor managers ($4,500–$6,500), lighting technicians ($6,000), etc. When broadcast transmission facilities are added, they require transmitter engineers ($8,500–$10,000) and a chief engineer ($10,000 or $12,000) with a first-class FCC license. These are *continuing costs,* year after year.

Maintenance Costs. Maintenance costs vary widely according to the initial quality of the equipment, type of use (stationary or mobile), size of the system, and its age. If any generalization can be made concerning maintenance costs, it would seem to be the rule of thumb advanced by several major equipment manufacturers. They suggest that maintenance of equipment can be expected to cost approximately 10 percent per year of the original cost of the equipment. Maintenance will probably run considerably less than 10

percent during the first few years of operation and considerably more than 10 percent during the final years. Incidentally, this 10 percent maintenance figure is predicated upon the assumption that equipment lasts ten years, on the average.

SCHOOL PLANT IMPLICATIONS

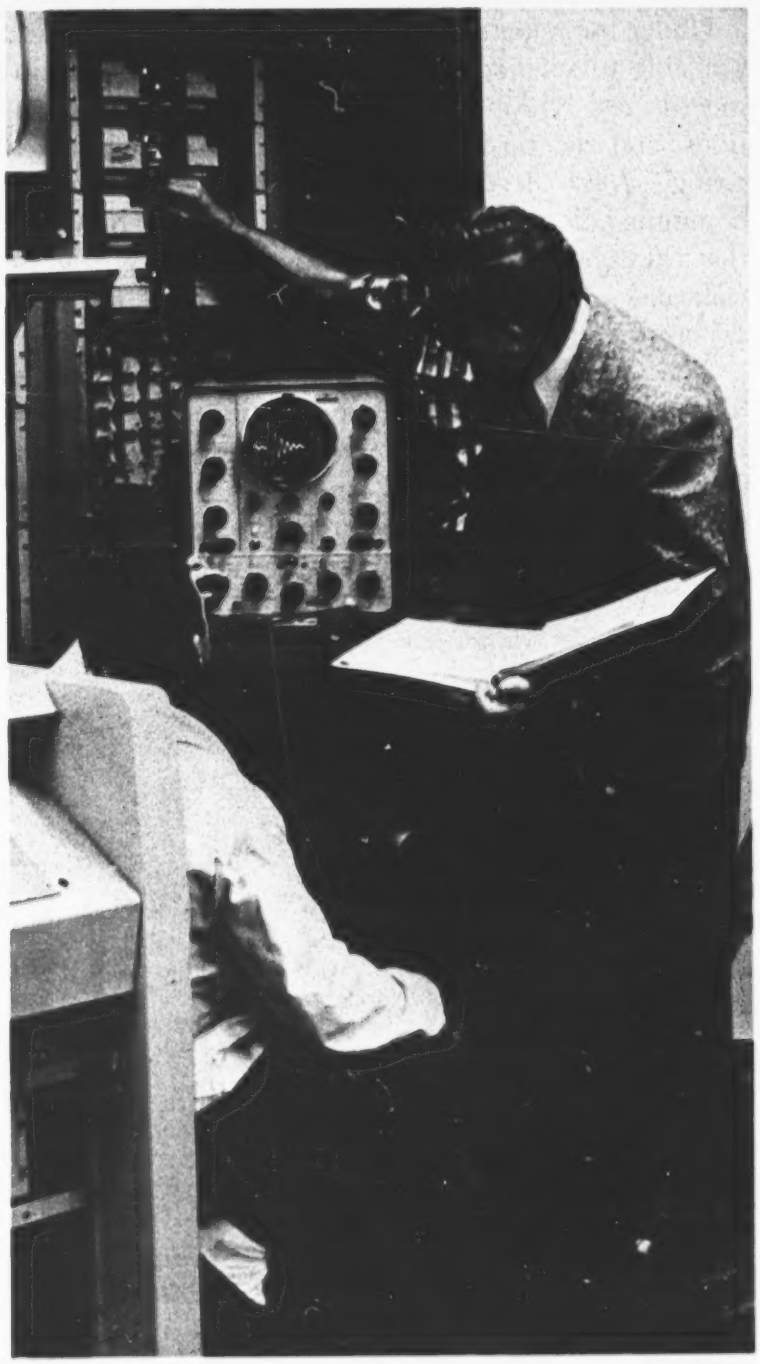
The inclusion of television in a school program holds considerable implications for school plant construction. However, recent developments in programmed instructional materials, language laboratories, computers, various forms of data storage, retrieval, and distribution methods, and the like, suggest that TV will be only one of many instructional media in the next decade. Unfortunately, there is little research-documented guidance for administrators and architects who must design the plans to house instructional systems of the 1970s.

About the only trends that can be perceived at this time concerning school plant provisions for the newer media are as follows:

- A trend toward the centralization of instructional resources (library materials, films, video tapes, audio tapes, and the like)
- A trend toward distribution systems which allow easy access to learning resources by teachers, classes, and individual students at remote locations

These two trends seem to dictate the provision of multipurpose, high-capacity distribution systems within school buildings, between buildings on a school campus, and between school campuses. If distribution systems are to be provided, it is desirable to build into new school plants conduit of adequate size, or space for conduit, leading from the central learning resource area to all instructional areas.

Most of the ideas concerning school plant modification for the inclusion of newer media have come from media personnel and architects. Although these ideas are valuable, they do not provide the school administrator who is faced with the responsibility for making decisions on plant construction or modification with the same confident base for judgment that data from controlled experimental comparisons would. One notable exception has been the research and development supported by the Educational Facilities Laboratories. Particularly helpful is *Case Studies of Educational Facilities*, published by EFL, 477 Madison Avenue, New York, New York 10022.



Students learn clerical and technical TV duties. The oscilloscope is one type of test equipment, which is a necessity in maintaining critical adjustments in a large system.

CHAPTER 6

Continuing Technology and the Educator

In previous chapters, the development of instructional television has been discussed and its current status presented with some rough estimates of cost in acquisition of television equipment for installations in public schools. To make predictions for the future is not the basic purpose of this booklet; but, in summary, a final consideration of the proliferation of newer technological devices which are a part of the total television concept or of television devices which may be a part of our newer approaches to instruction should be discussed briefly.

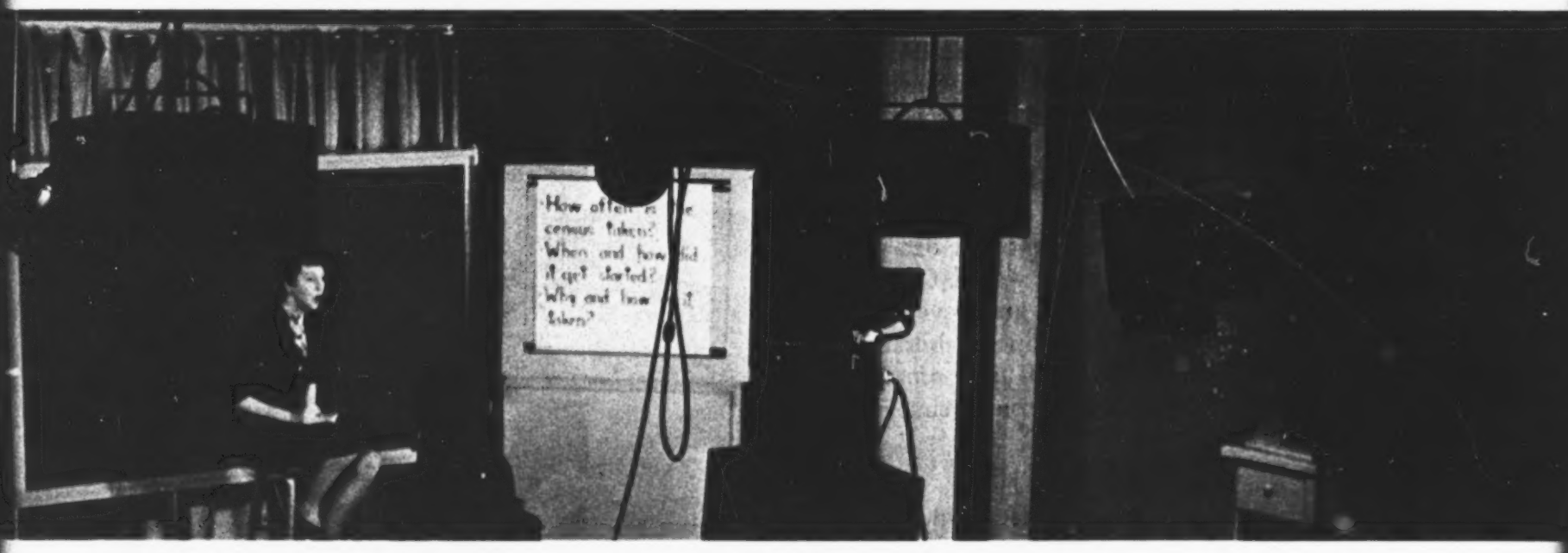
Under the impetus of grant monies now being made available to schools, the purchase of television equipment is now within the reach of many school organizations, and the possibilities of their use is indeed exciting. New developments in the technology of communications are advancing so swiftly, however, that the school administrator must constantly exercise care and caution, and seek the advice of unbiased experts before buying equipment.

The portable video tape recorder is an example. The capability of such a recorder to record, to store for future use, or to instantly play back information in both picture and sound, and then to erase this information and record and replay, has applications which are challenging to many teachers and other school people. There are now on the market about a dozen of these light (28 to 100 pounds) machines, costing from $1,250 to $10,000, and several more producers of electronic equipment are ready to announce their models for sale. Not one of these inexpensive tape recorders, however, is compatible with any other similar recorder. Tapes recorded on one model cannot be exchanged and played on another. Either the tape is of a different width, or runs at a different speed, or is recorded on a different type of recording head. Only the larger, very expensive broadcast machines can exchange and play back tapes.

To assist in resolving this problem, the State Department of Education is currently conducting a study of the current makes of video tape recorders with the purpose of developing guidelines for their economical purchase in the light of instruction-justified need. This study is funded by an ESEA, Title V, grant.

The need for other studies of this kind is great, and it is hoped that in the future further funds may be made available as needs are identified. Until such a time, careful assessment by unbiased electronic engineers and justification in terms of instructional utilization should govern the acquisition of newer types of equipment.

Television, like other teaching tools, should be used to solve specific instructional problems.



APPENDIX A

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